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SPECIAL NEEDS EDUCATION MATERIAL FOR VOCATIONAL AND INDUSTRIAL EDUCATION

AN APPARATUS PLANBOOK

Developed as a Resource Guide for

ASSISTING THE PHYSICALLY HANDICAPPED:
AN IDENTIFICATION AND DEVELOPMENT
OF APPARATUS FOR LABORATORY SHOPS

KENNETH L. BRUWELHEIDE, Ed.D.
Project Director

Department of Agricultural and Industrial Education
Montana State University
Bozeman, Montana

Montana State Office of Public Instruction
Vocational Education
Helena, Montana

1982

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1983
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ACKNOWLEDGEMENTS

I greatly appreciate the support given to the continuing vocational special needs project:

Assisting the Physically Handicapped:
An Identification and Development
Of Apparatus for Laboratory Shops

by the Office of Public Instruction of the State of Montana, Helena, and in particular, to the Vocational Special Needs Department of this office. Support by this agency has made this effort possible.

Special appreciation is extended to Donald E. Harrington for his knowledge of the handicapped, technical laboratory/shop skills, and technical drawing expertise. Donald's technical illustrations in this planbook make construction details concise.

Additional thanks is given to the Department of Agricultural and Industrial Education, Montana State University, and, in particular, to Dr. Max Amberson, Chairman, for continued supportive service and encouragement.

Kenneth L. Bruwelheide, Ed.D., 1982

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INTRODUCTION

This planbook is a collection of technical drawings, illustrations and bills of material of apparatus developed to assist the physically handicapped while working in a vocational area laboratory/shop setting. Most apparatus included are designed as retrofit items to be placed on, or added to, existing commercial woodworking and metal working tools and equipment.

Safety and proper tool usage was a prime consideration while developing these apparatus. Every effort was made to preserve correct operational procedures.

It is noted that these apparatus will not solve machine/tool operation difficulties for all handicapping conditions. Each handicapped individual has their own set of abilities and disabilities. Hopefully these plans may serve as a guide for the continued development of such apparatus for many handicapped individuals.

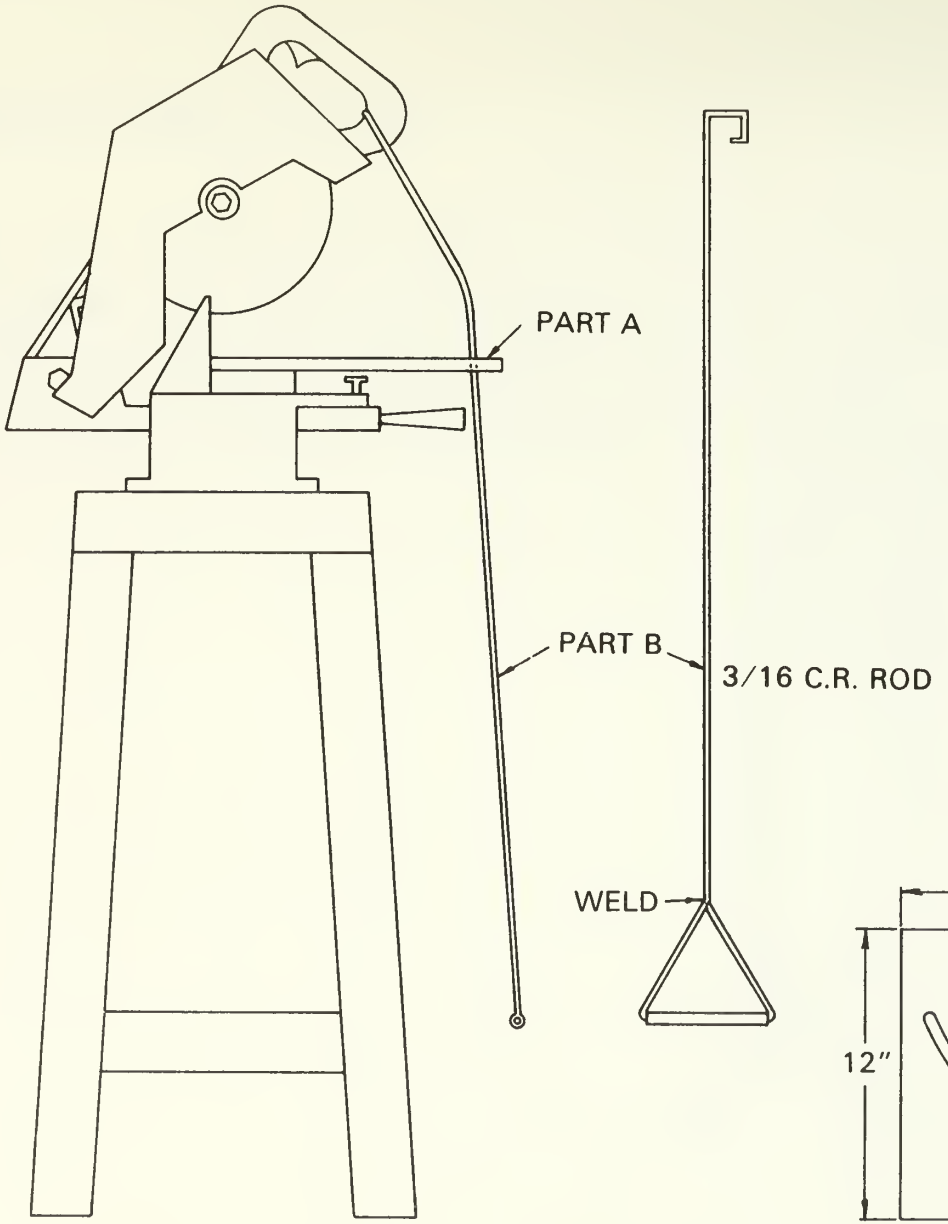
While planning,constructing, and testing these apparatus the following factors were kept in mind:

A. Safety of use
B. Simplicity
C. Availability of materials
D. Expense
E. Ease of construction
F. Not to restrict the use of tools and equipment by the non-handicapped

Each of the following items is complete with an orthographic drawing, an isometric illustration, and a bill of materials. It should be noted that dimensions may need to be changed to fit particular pieces of equipment.

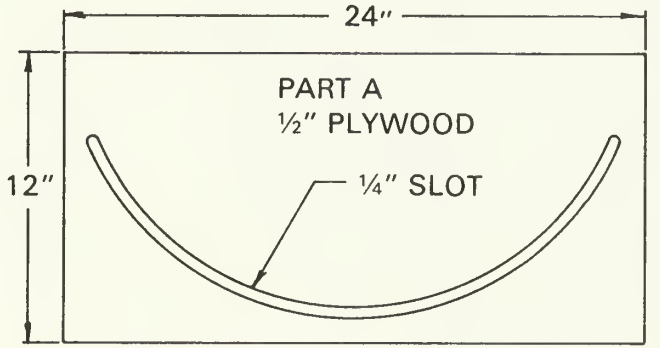
TABLE OF CONTENTS

Item	Dwg. No.
Power Miter	1
Push Stick	2
Drill Press Sanding Jig	3
Jointer Fence	4
Table Saw Fixture	5
Band Saw Table	6
Jig Saw Fixture	7
Drill Press Fixture	8
Work Bench	9
Wheelchair Cart	10
Router Table	11
Radial Arm Saw Fixture	12
Transfer Board	13
Wheelchair Reading Board	14



NOTE: DIMENSIONS FOR PART B ARE DETERMINED BY THE MAKE AND SIZE OF POWER MITER SAW USED.

NOTE: A FOOT SWITCH FROM A SEWING MACHINE REPLACES THE HAND SWITCH. TAPE THE TRIGGER CLOSED AND PLUG THE SAW INTO THE REOSTAT LINE.



APPARATUS FOR THE HANDICAPPED

THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM

K. L. BRUWELHEIDE
MONTANA STATE UNIVERSITY
MONTANA OFFICE OF PUBLIC INSTRUCTION

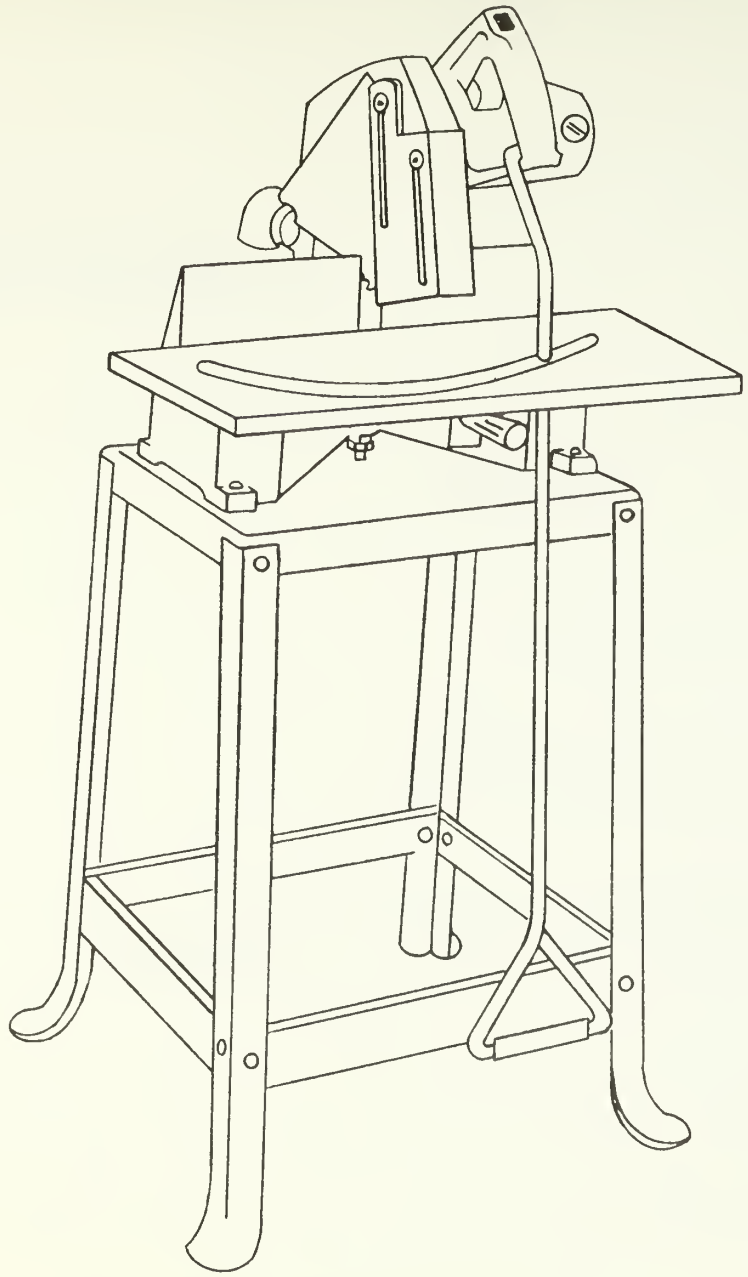
DWG 1

SCALE: ⅛″ = 1″

TITLE: FOOT OPERATED POWER MITRE SAW

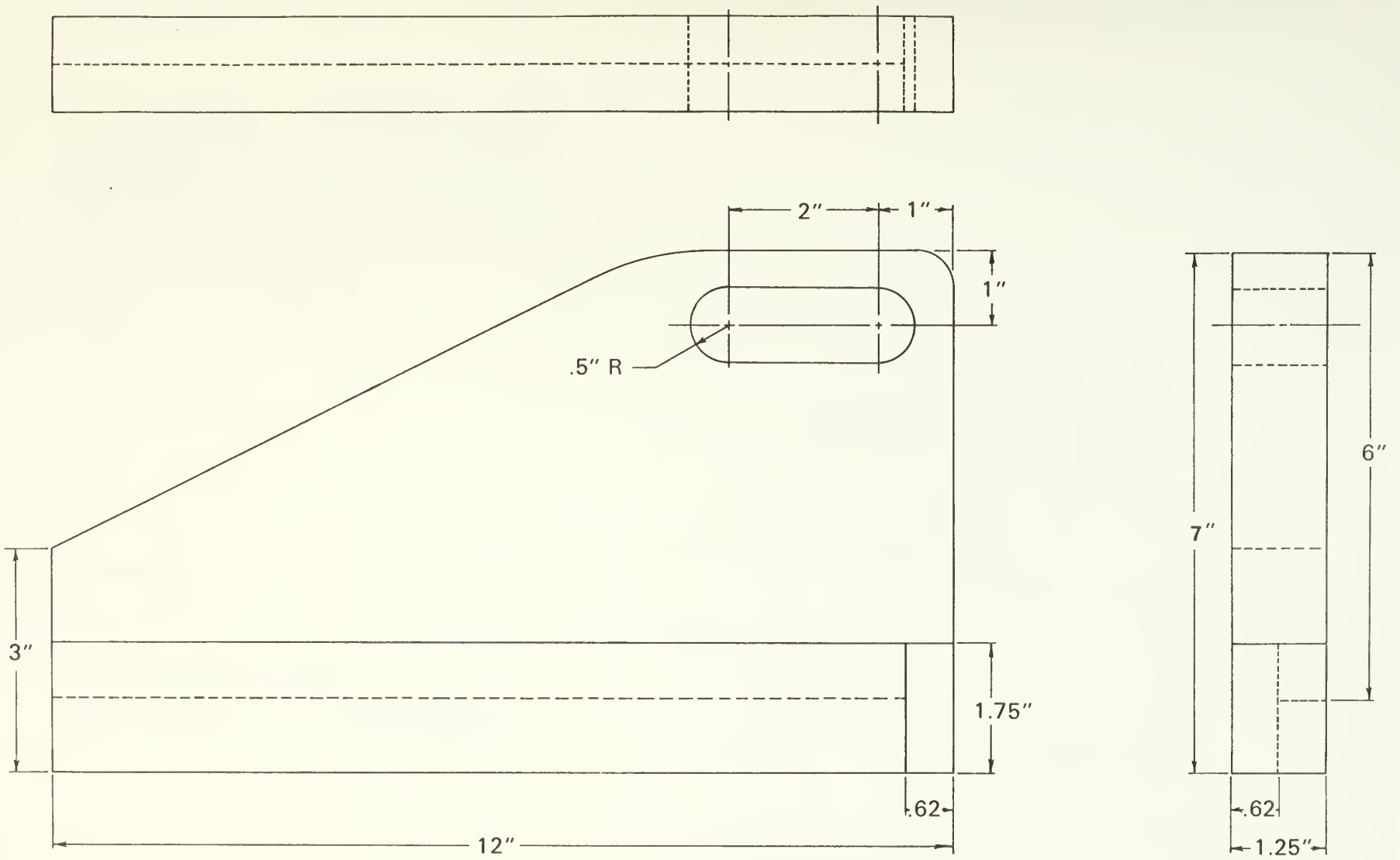
FOOT OPERATED POWER MITRE SAW

THE SUPPLEMENTARY FOOT OPERATED LEVER GIVES THE MACHINE GREATER VERSATILITY IN ASSISTING THE HANDICAPPED. A LARGER TABLE SURFACE AREA IS ALSO PROVIDED.



POWER MITER SAW
FOOT OPERATION ADAPTOR

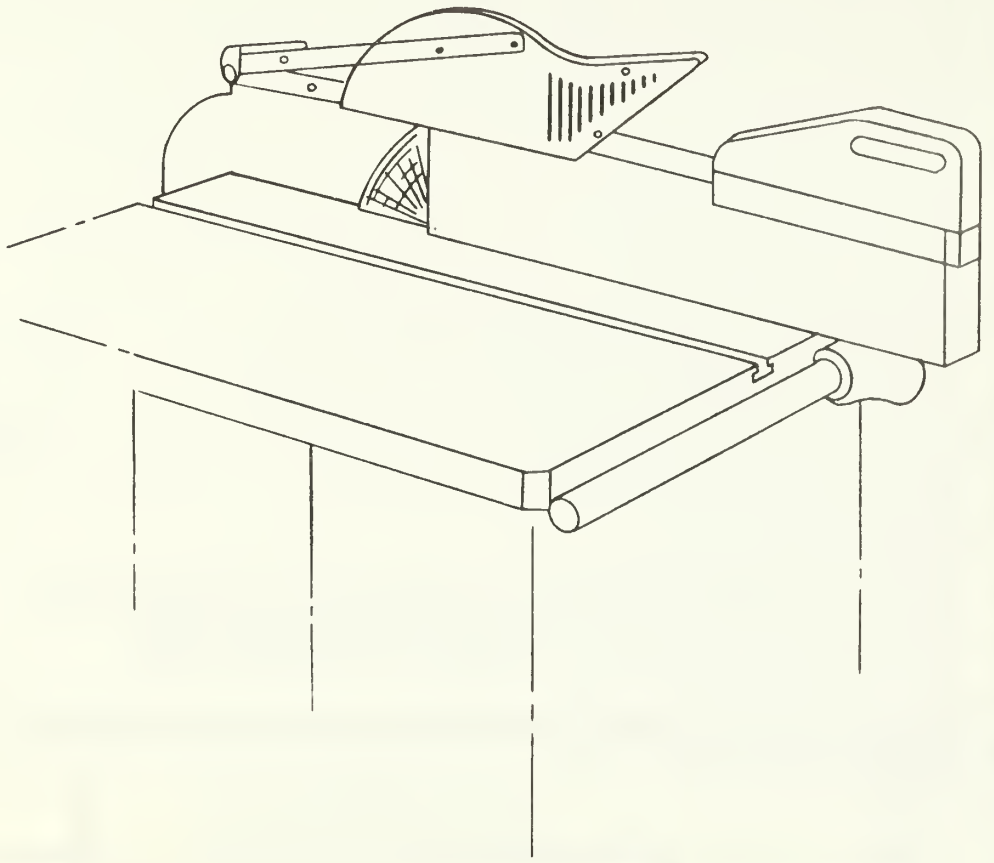
ITEM	MATERIAL
CUTTING BASE	½" PLYWOOD
FOOT ROD	3/16" DIA. C. R. ROD
SWITCH	FOOT OPERATED SEWING MACHINE SWITCH



APPARATUS FOR THE HANDICAPPED		
THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM	K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 2
SCALE: ½″ = 1″	TITLE: PUSH STICK	

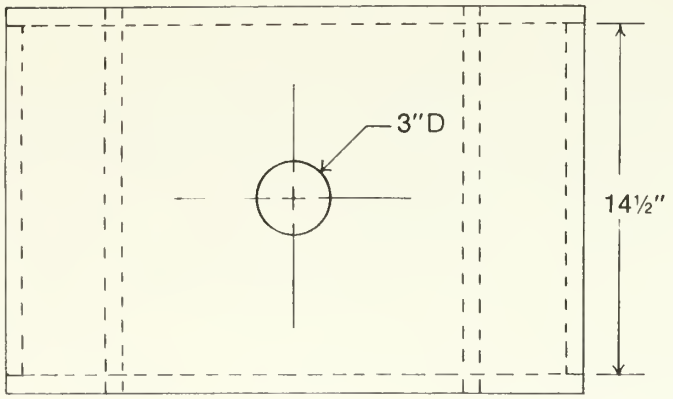
PUSH STICK

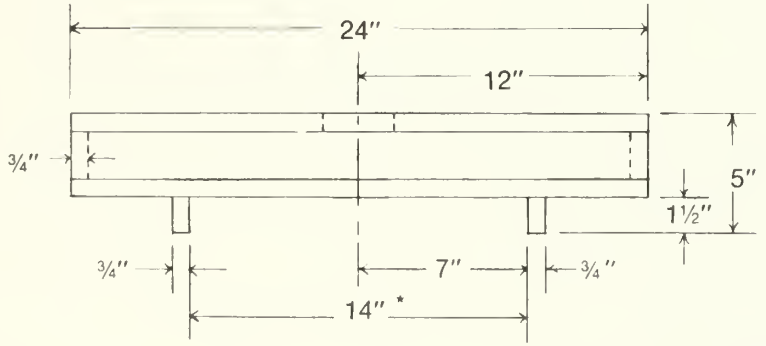
A LARGE SAFETY FEED STICK MAY BE USED ON A VARIETY OF STATIONARY CUTTING MACHINES. THIS PARTICULAR DESIGN IS WELL SUITED FOR ALL STUDENTS AS IT PROVIDES SUPPORT ON TWO EDGES OF THE WORKING STOCK.

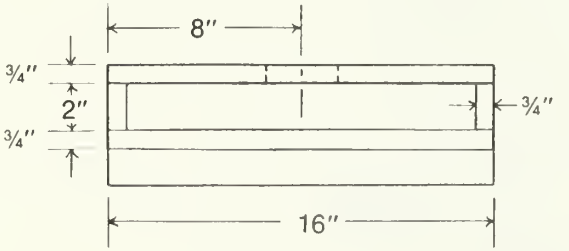


MATERIAL

2" x 8" (1½ x 7½) PINE.
¾" x 2" PINE.
1¼" x #6 FLAT HD WOOD SCREWS.





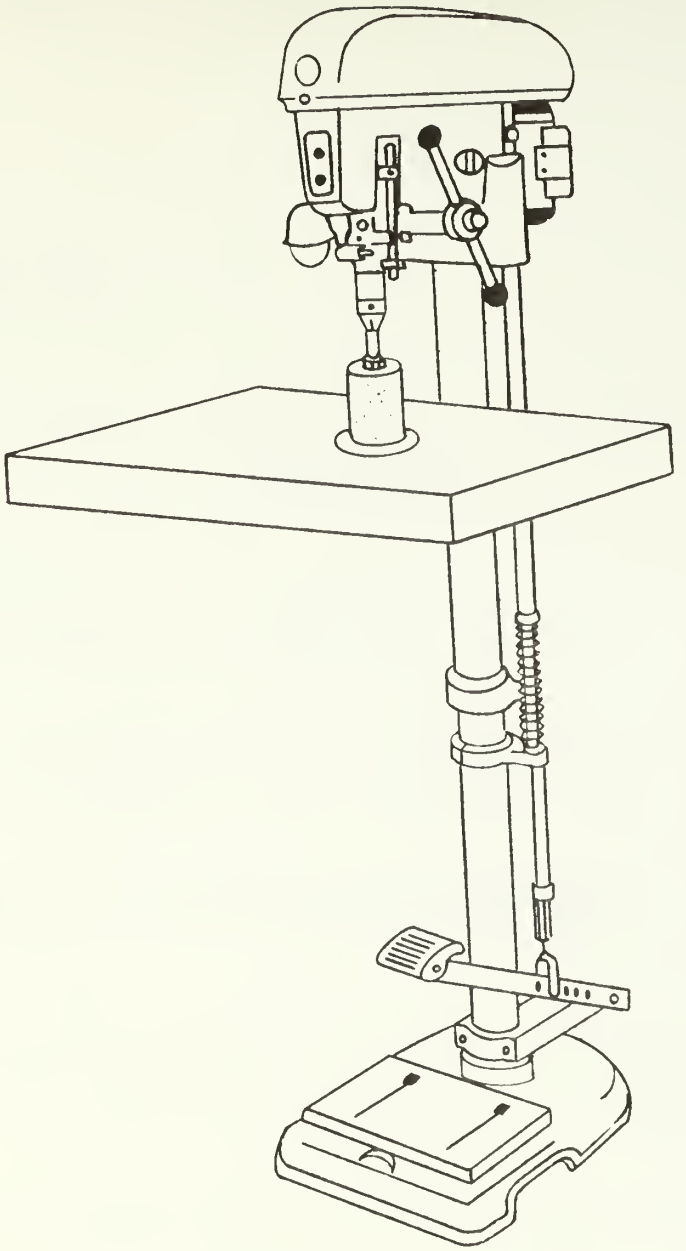


*NOTE: THE DISTANCE BETWEEN THE RAILS WILL VARY DEPENDING UPON THE MAKE AND SIZE OF DRILL PRESS BEING USED

APPARATUS FOR THE HANDICAPPED			
THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM		K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 3
SCALE ⅛" = 1	TITLE: DRILL PRESS SANDING JIG		

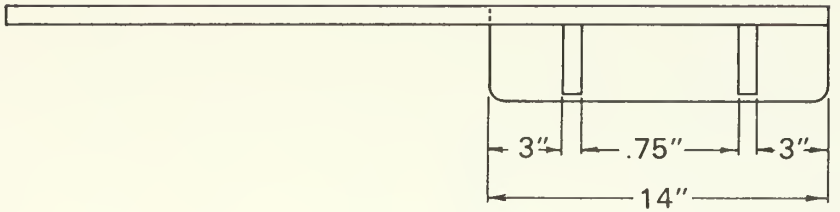
THE DRILL PRESS SANDING JIG

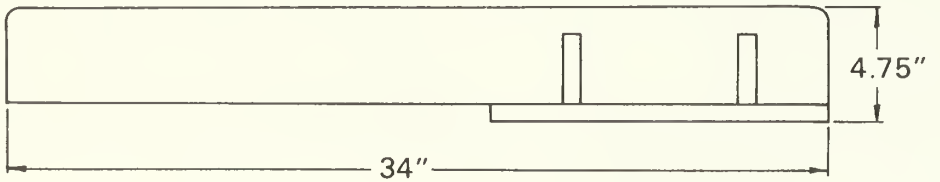
THIS LARGE WORK TABLE ENABLES A SANDING DRUM TO EXTEND BELOW THE TABLE. IN ASSISTING THE HANDICAPPED, A SPRING-BALANCED FOOT FEED FREES OPERATORS HANDS FOR DRILLING OPERATIONS.

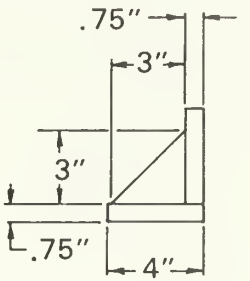


DRILLPRESS SANDING JIG

ITEM	MATERIAL
TOP & BOTTOM TABLES	¾" PLYWOOD - PREFERABLY BIRCH
SUPPORT RAILS AND SPACER RAILS	¾" SOLID STOCK - HARDWOOD
FASTENERS	#8 x 1¼" FLAT HD WOOD SCREWS

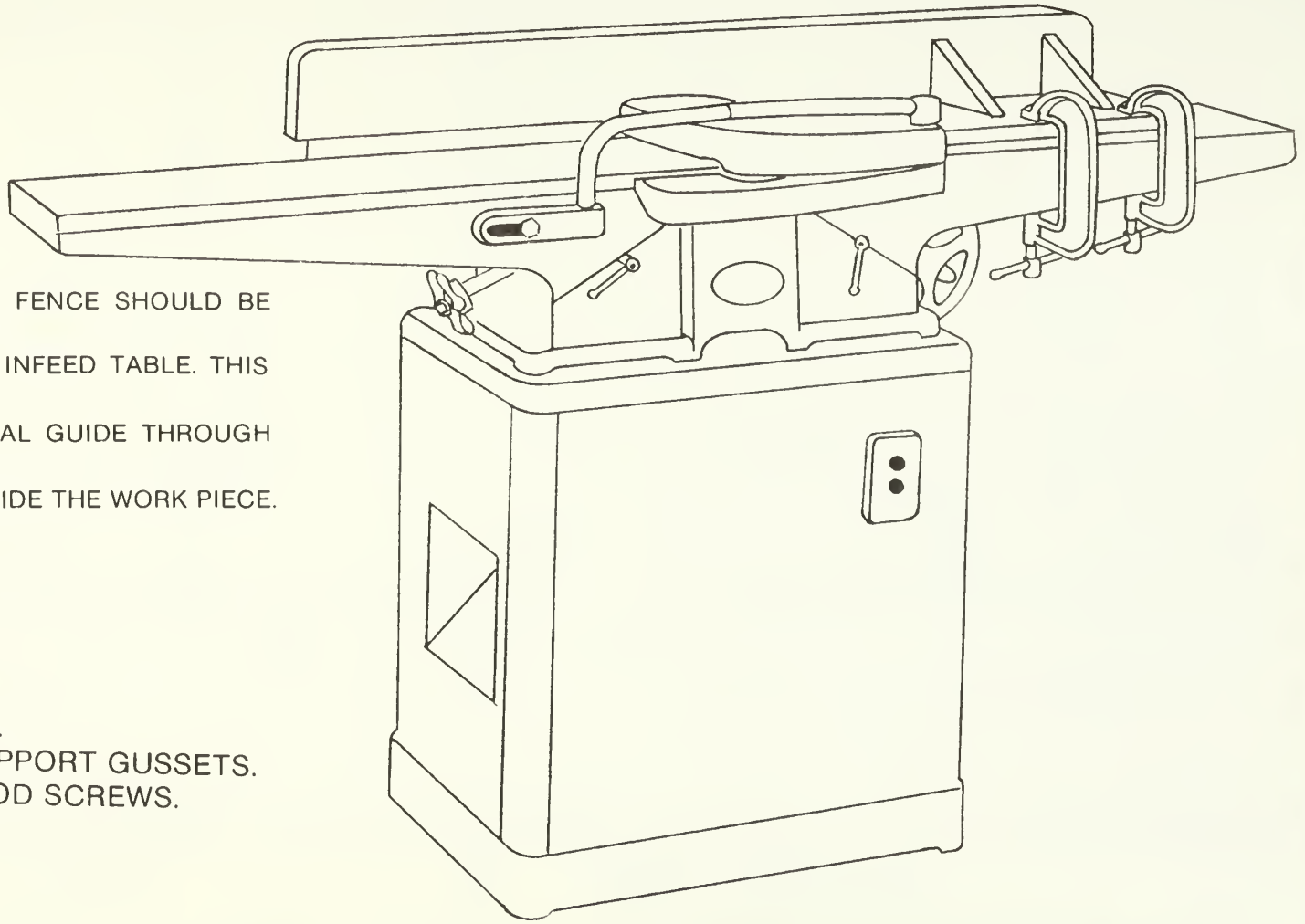






APPARATUS FOR THE HANDICAPPED		
THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM	K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 4
SCALE: ⅛″ = 1″	TITLE: JOINTER FENCE	

THE JOINTER FENCE

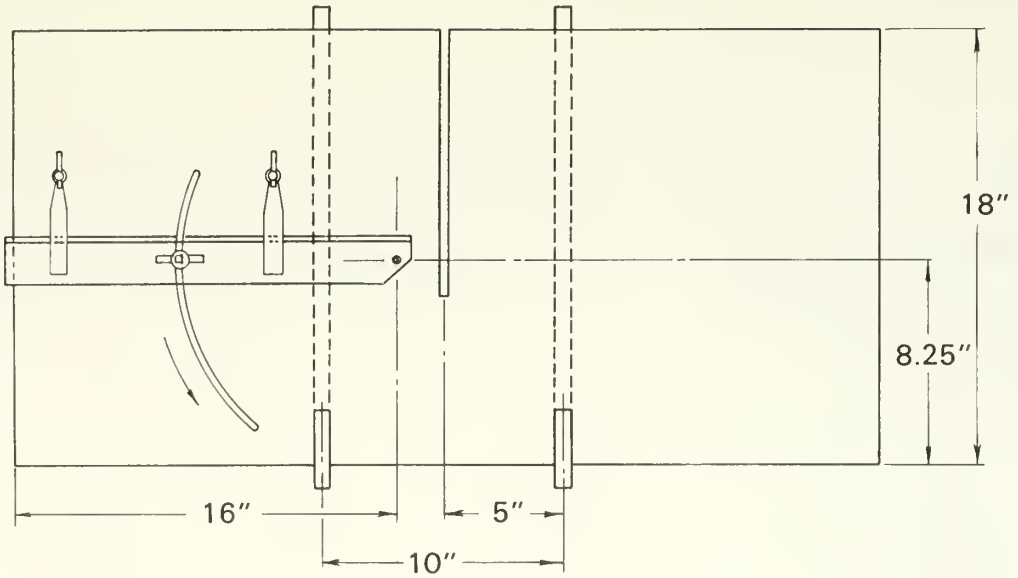


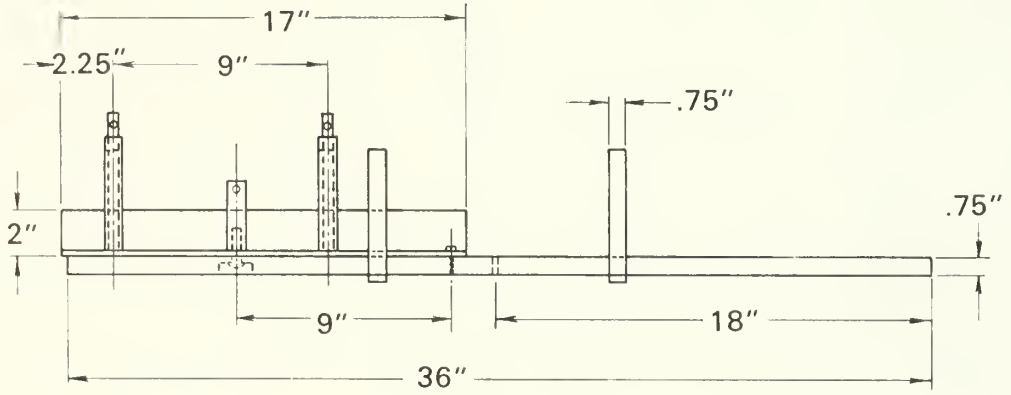
THE AUXILIARY JOINTER FENCE SHOULD BE CLAMPED TO THE FRONT INFEED TABLE. THIS JIG SERVES AS A VERTICAL GUIDE THROUGH WHICH TO SLIDE THE WORK PIECE.

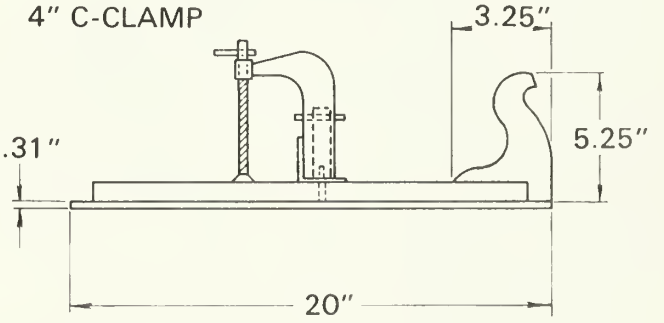
MATERIAL

¾" PLYWOOD (BIRCH).
¾" SOLID STOCK - SUPPORT GUSSETS.
1¼" x #8 FLAT HD WOOD SCREWS.

FOR FENCE LOCK AND C-CLAMP
DETAIL PLEASE REFER TO THE
RADIAL ARM SAW FIXTURE DRAWING.







APPARATUS FOR THE HANDICAPPED		
THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM	K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 5
SCALE: ⅛″ = 1″	TITLE: TABLE SAW FIXTURE	

THE TABLE SAW FIXTURE

THIS BOARD FIXTURE SLIDES IN THE TABLE SAW MITRE SLOTS. THE WORKPIECE IS SAFELY HELD IN PLACE WITH A FENCE CLAMP ARRANGEMENT.

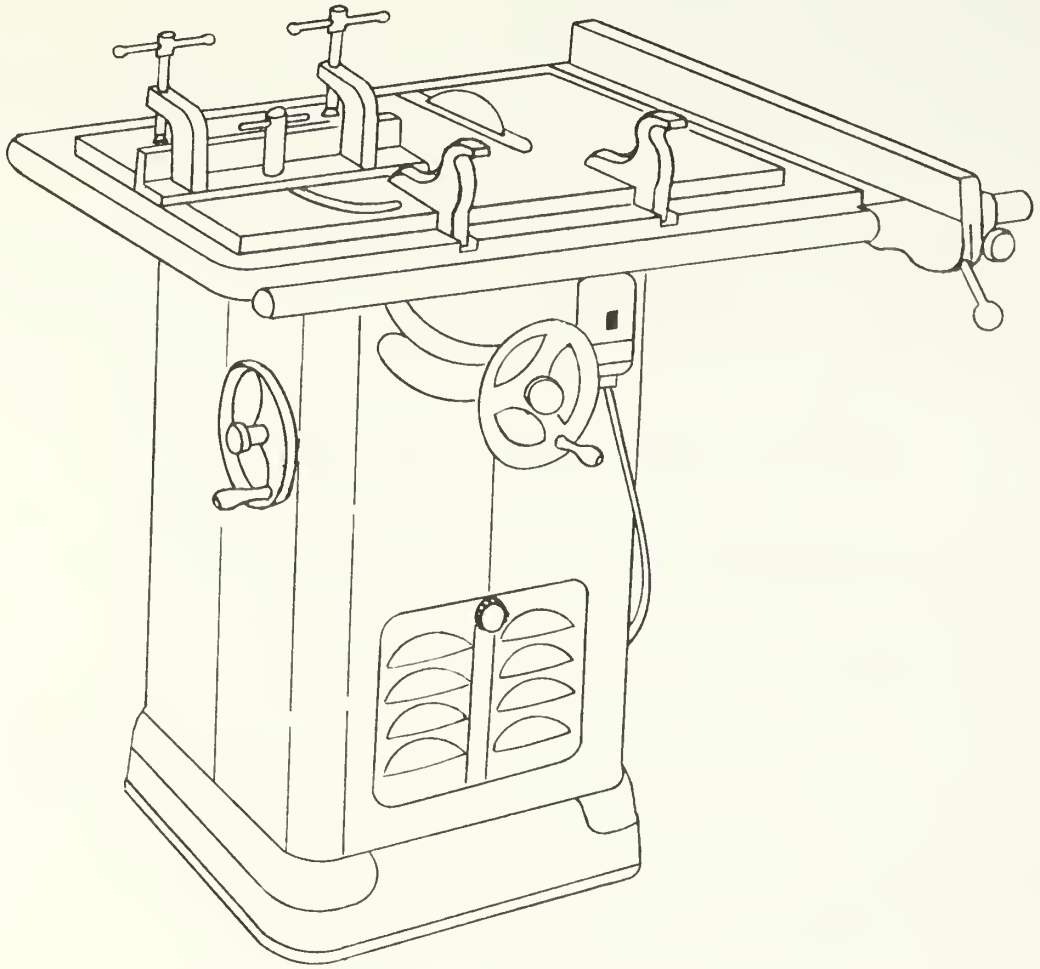
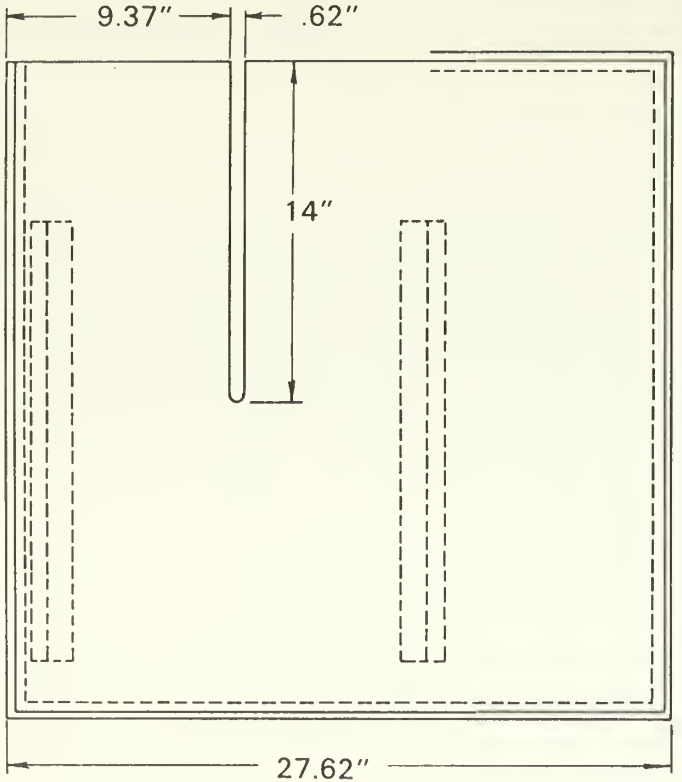
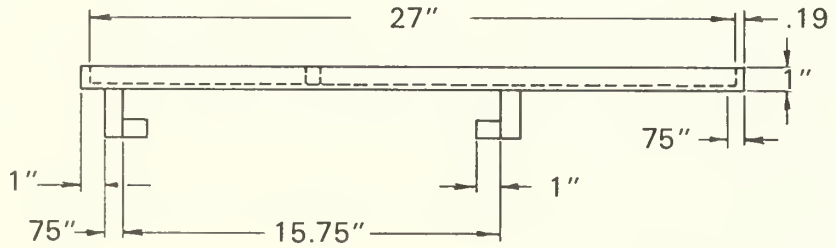
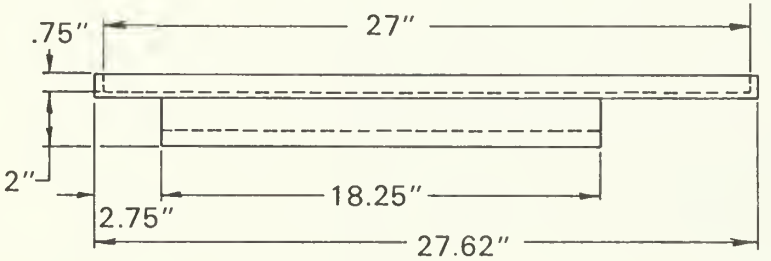


TABLE SAW FIXTURE

ITEM	MATERIAL
MOVABLE CUTTING TABLE	¾" PLYWOOD - PREFERABLY BIRCH
MITER GAUGE GROOVE RAILS	¾" SOLID STOCK - HARDWOOD
HANDLES	¾" SOLID STOCK - HARDWOOD
MOVABLE FENCE	2" x 2" x ¼" ANGLE IRON
MATERIAL CLAMPS	4" C-CLAMPS
FASTENERS	ASSORTED HARDWARE







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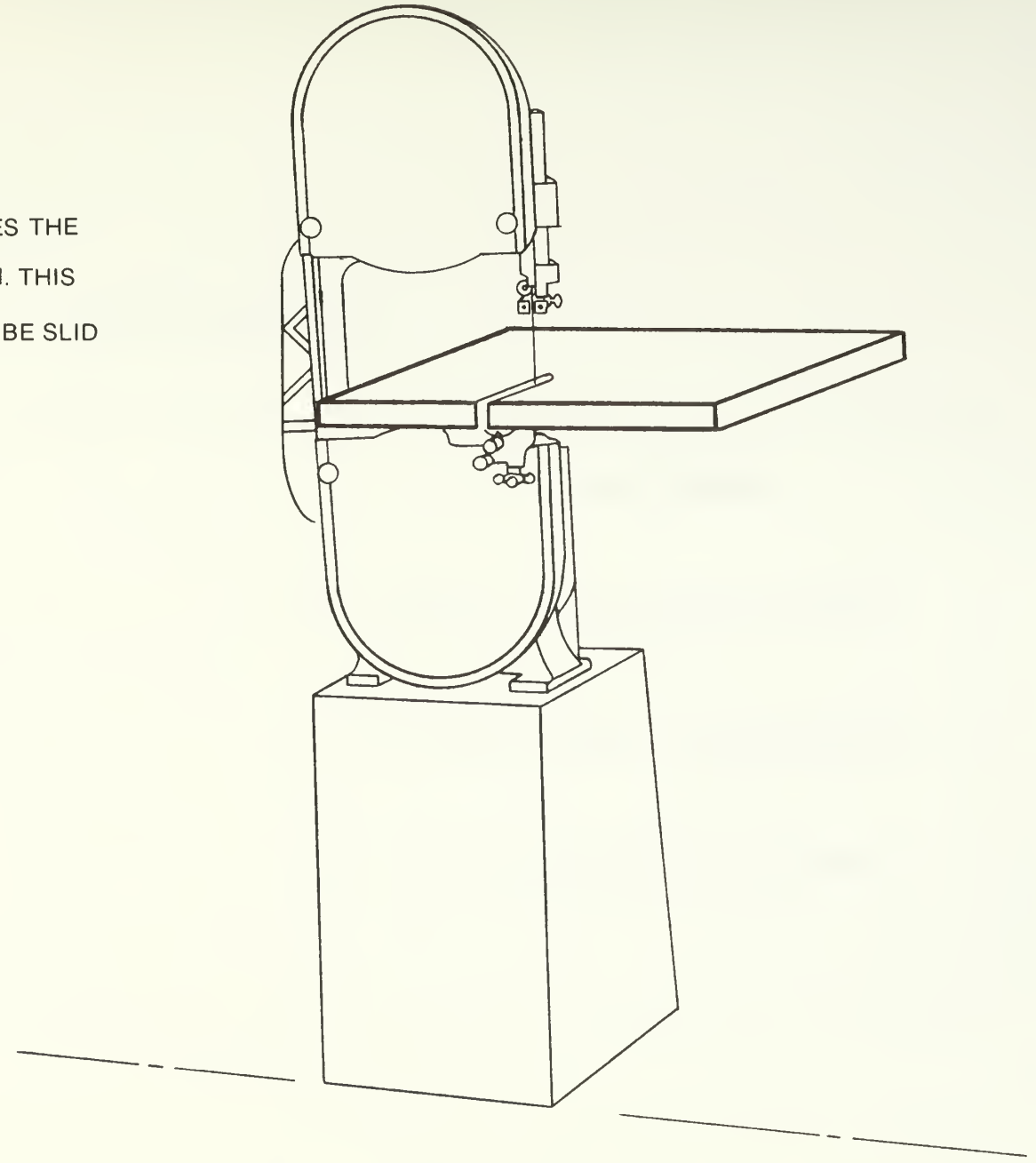
THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM	K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 6
SCALE: ⅛″ = 1″	TITLE: BAND SAW TABLE	

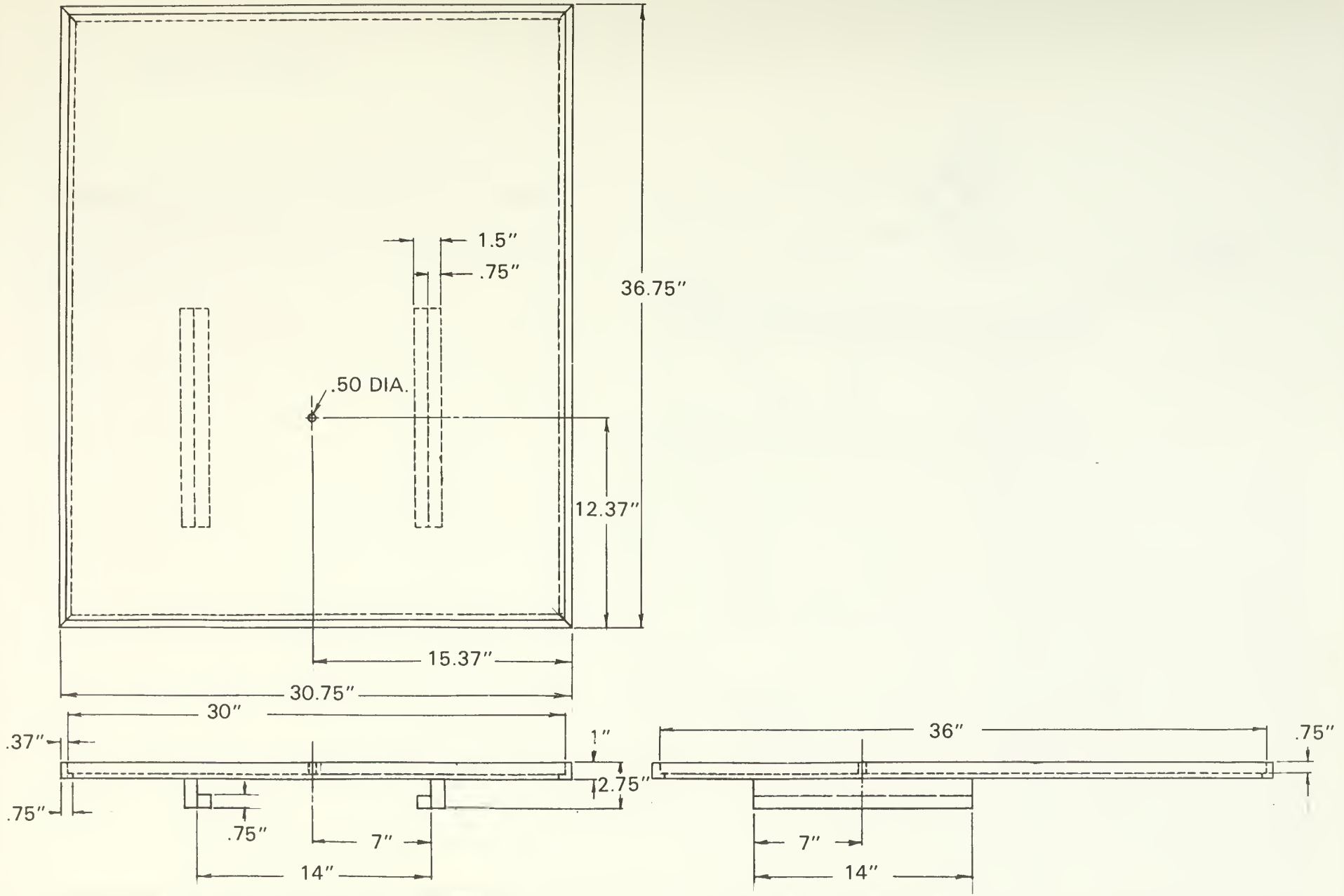
THE BAND SAW TABLE

THE ADAPTED BAND SAW TABLE INCREASES THE WORK SURFACE AREA DURING OPERATION. THIS LARGER TABLE ENABLES LONG PIECES TO BE SLID OR BALANCED WITH GREATER EASE.



BAND SAW TABLE

ITEM	MATERIAL
CUTTING SURFACE	¾" PLYWOOD - PREFERABLY BIRCH
HOLDDOWN RAILS	¾" SOLID STOCK - HARDWOOD
FASTENERS	#8 x 1¼" FLAT HD WOOD SCREWS



APPARATUS FOR THE HANDICAPPED

THE SPECIAL NEEDS LEARNER IN
THE VOCATIONAL CLASSROOM

K. L. BRUWELHEIDE
MONTANA STATE UNIVERSITY
MONTANA OFFICE OF PUBLIC INSTRUCTION

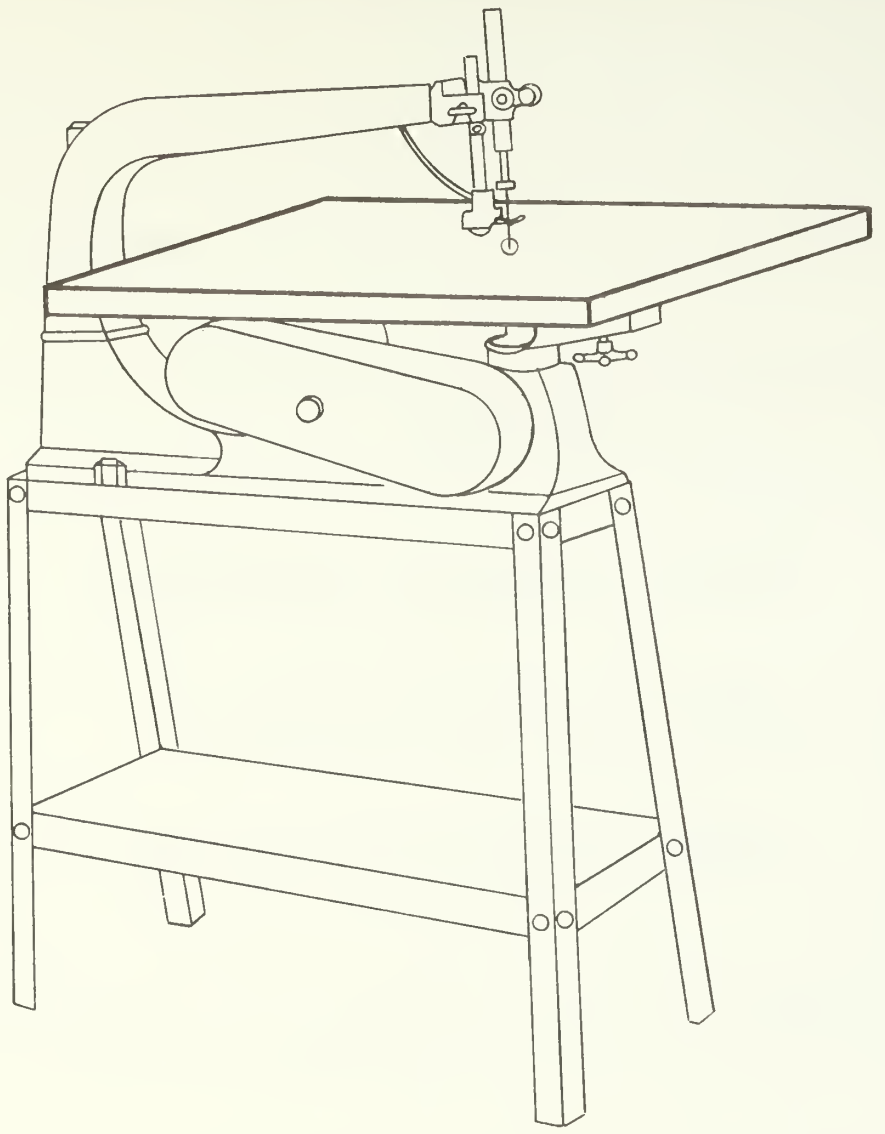
DWG
7

SCALE: ⅛" = 1"

TITLE: JIG SAW FIXTURE

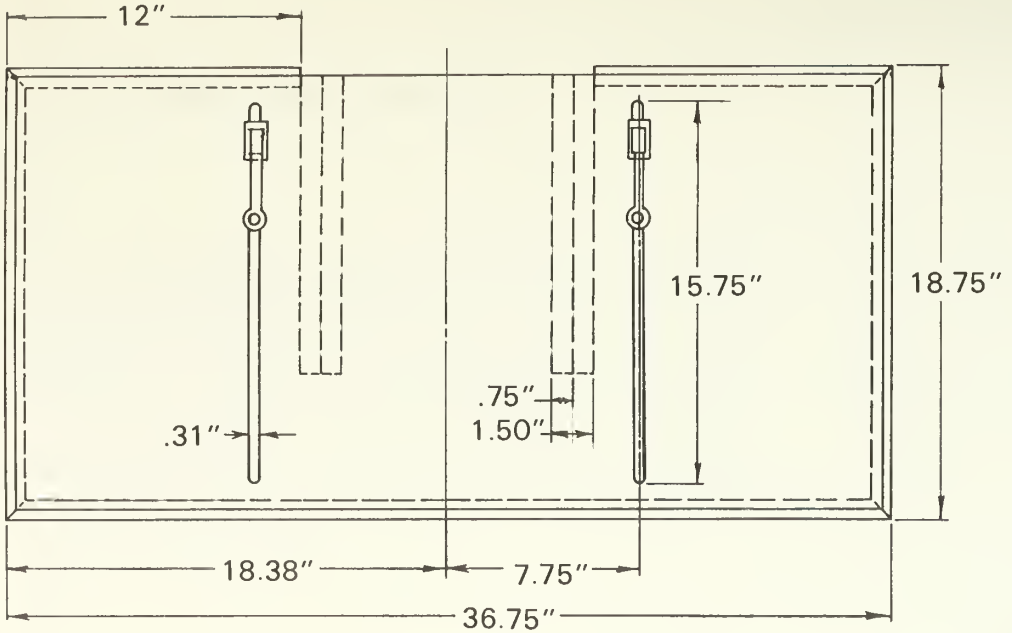
JIG SAW FIXTURE

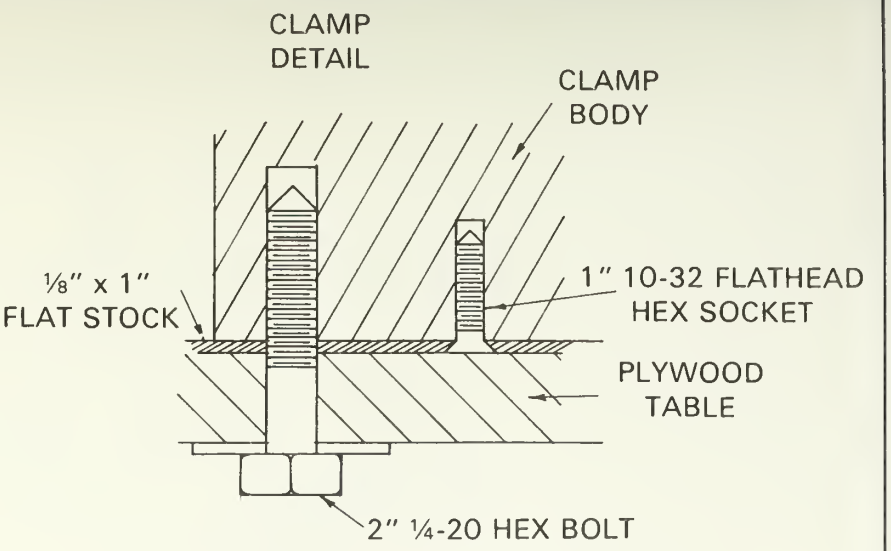
SIMILAR IN FUNCTION TO THE BAND SAW TABLE, THIS LARGER WORK AREA FACILITATES AWKWARD OR LONG STOCK.

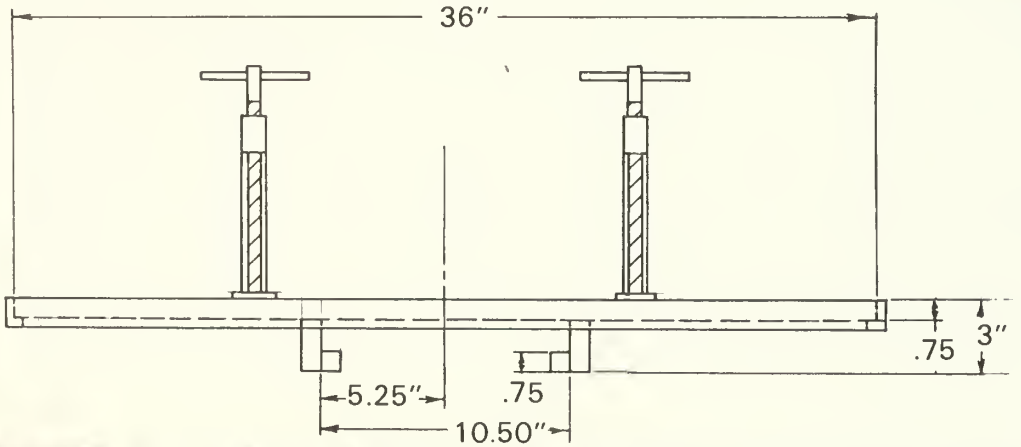


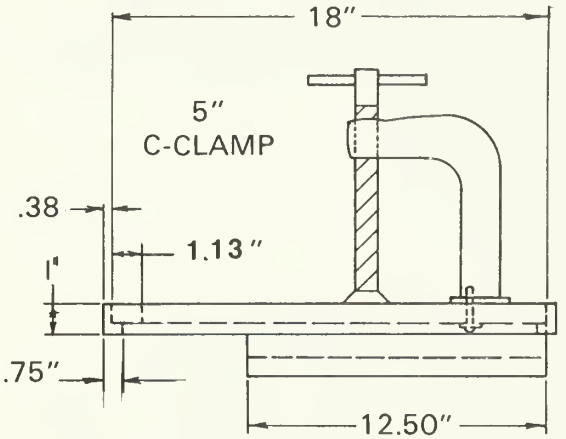
JIG SAW FIXTURE

ITEM	MATERIAL
CUTTING SURFACE	¾" PLYWOOD - PREFERABLY BIRCH
HOLDDOWN RAILS	¾" SOLID STOCK - HARDWOOD
FASTENERS	#8 - 1¼" FLAT HD WOOD SCREWS





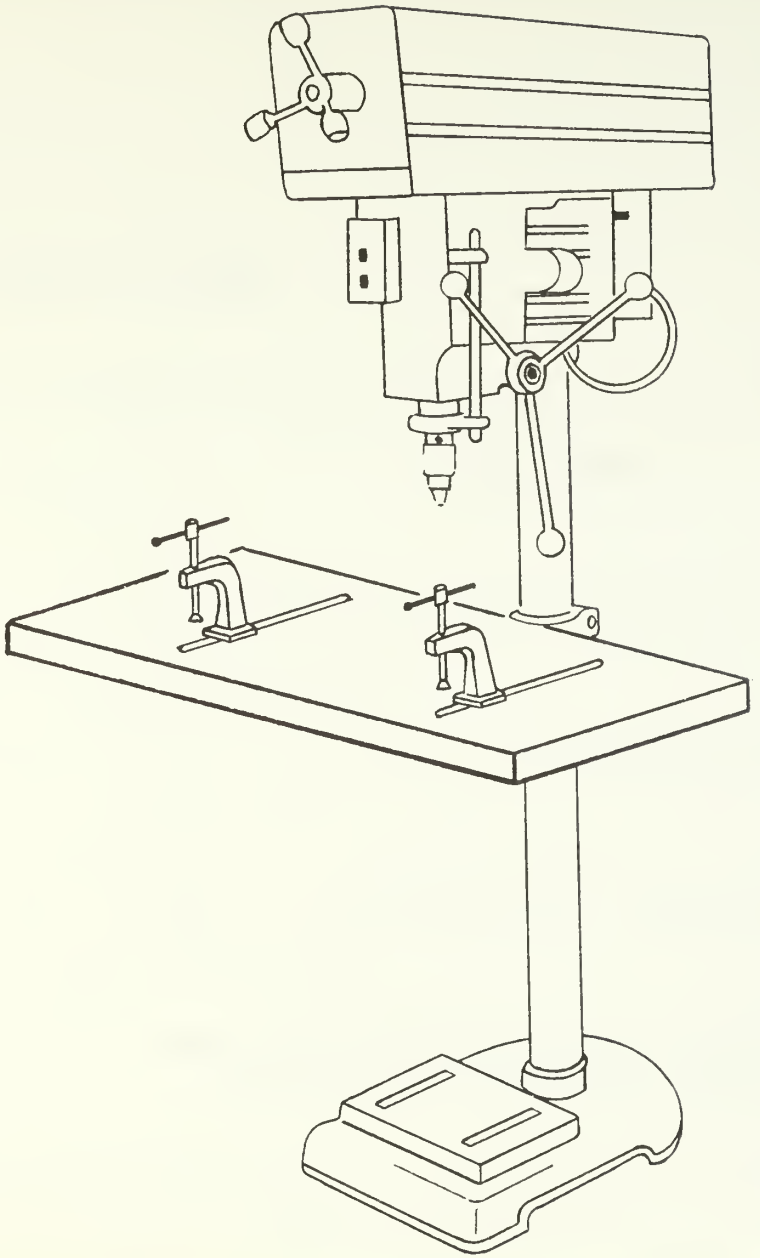




APPARATUS FOR THE HANDICAPPED			
THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM		K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 8
SCALE: ⅛″ = 1″	TITLE: DRILL PRESS FIXTURE		

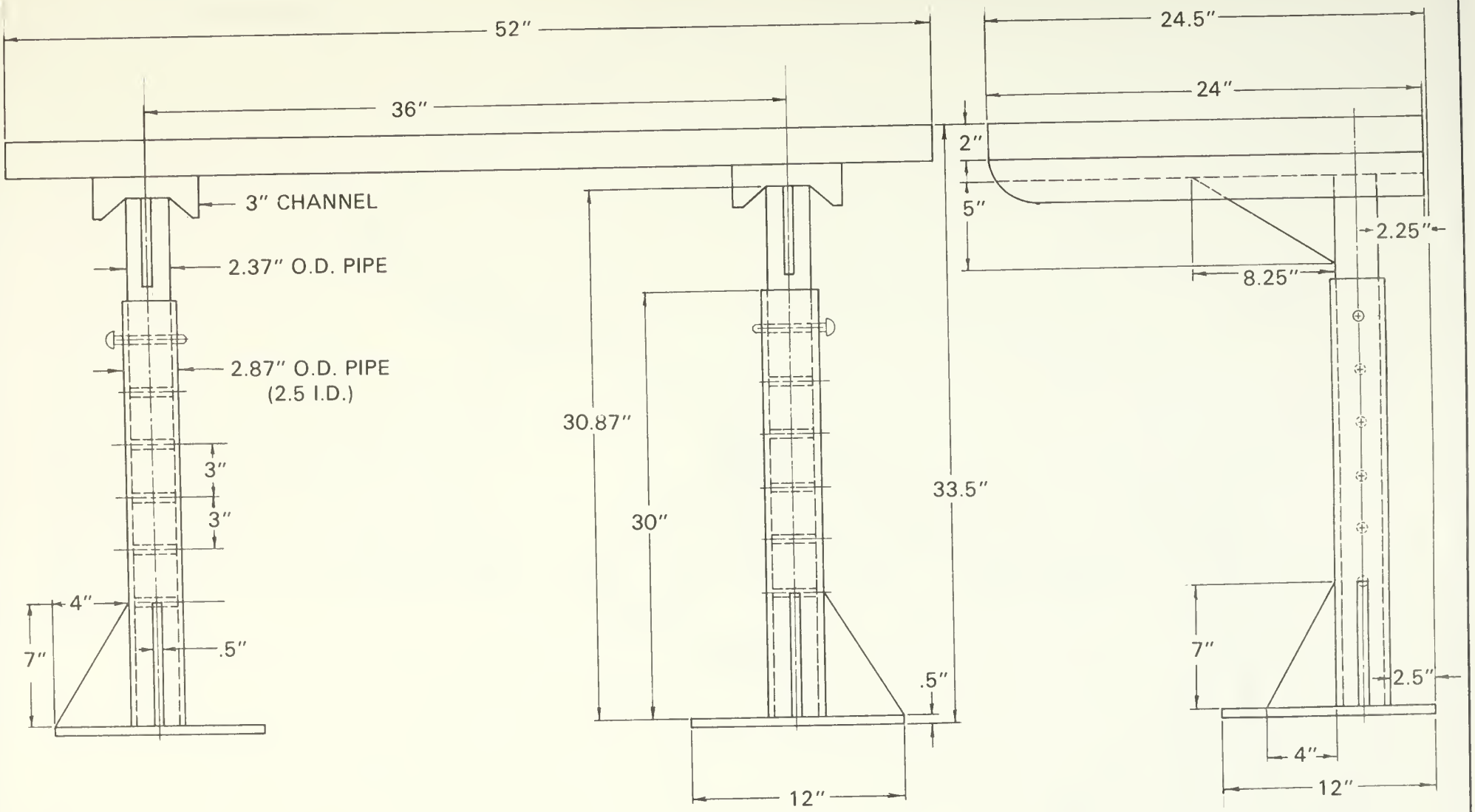
THE DRILL PRESS FIXTURE

TWO SLIDING C CLAMPS ALLOW BOTH LONG AND SHORT PIECES TO BE HELD SECURELY DURING A DRILLING OPERATION. THE EXTENDED TABLE IS DESIGNED TO SLIDE AND CLIP OVER THE EXISTING DRILL PRESS TABLE.



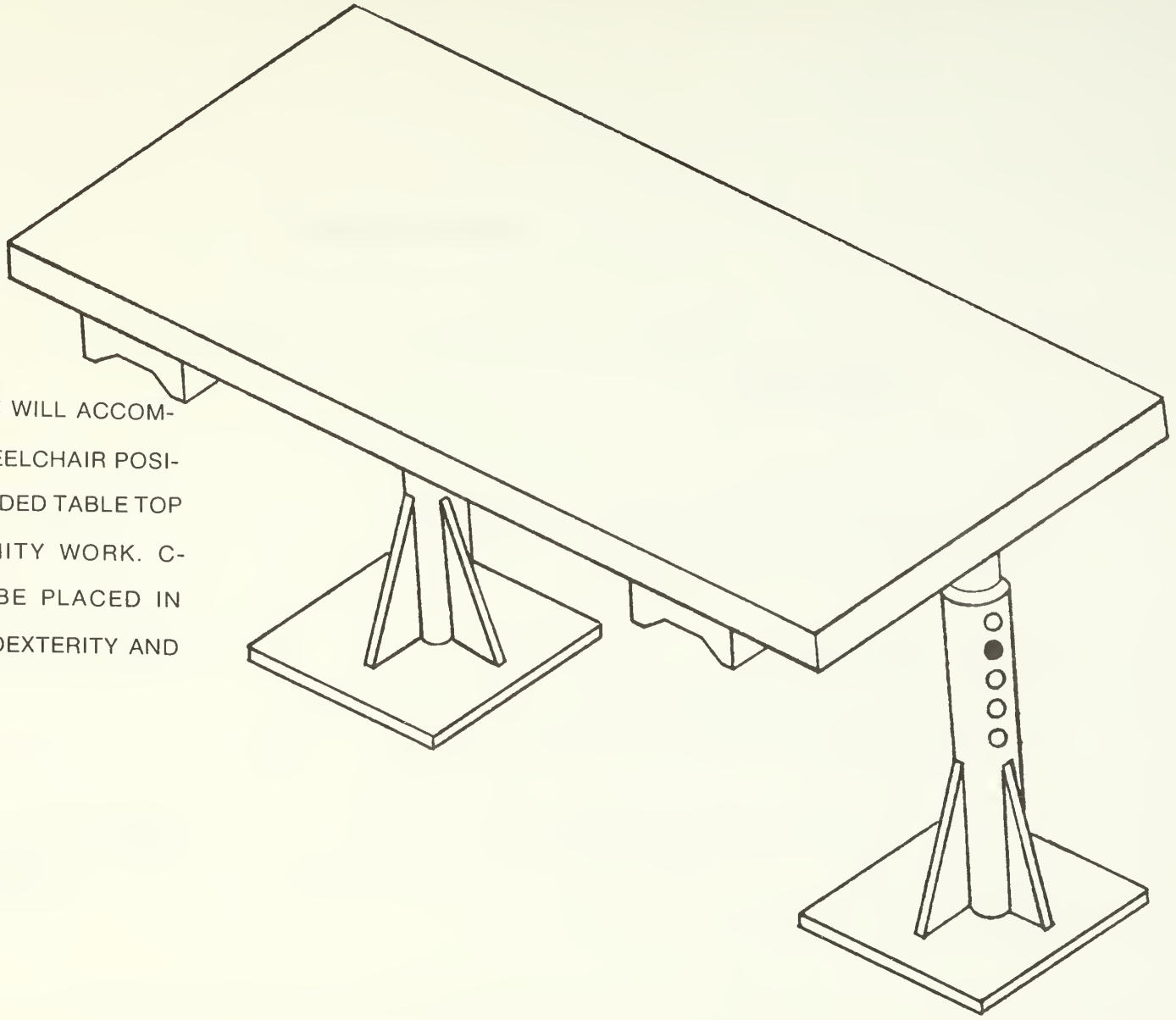
DRILL PRESS FIXTURE

ITEM	MATERIAL
TABLE BASE	¾" PLYWOOD - PREFERABLY BIRCH
HOLD DOWN RAILS	¾" SOLID STOCK
CLAMPS	5" C-CLAMPS - MODIFIED
FASTENERS	#8 - 1¼" FLAT HD WOOD SCREWS OTHERS AS PER DRWG. SPECS.



APPARATUS FOR THE HANDICAPPED		
THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM	K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 9
SCALE: ⅛″ = 1″	TITLE: WORKBENCH	

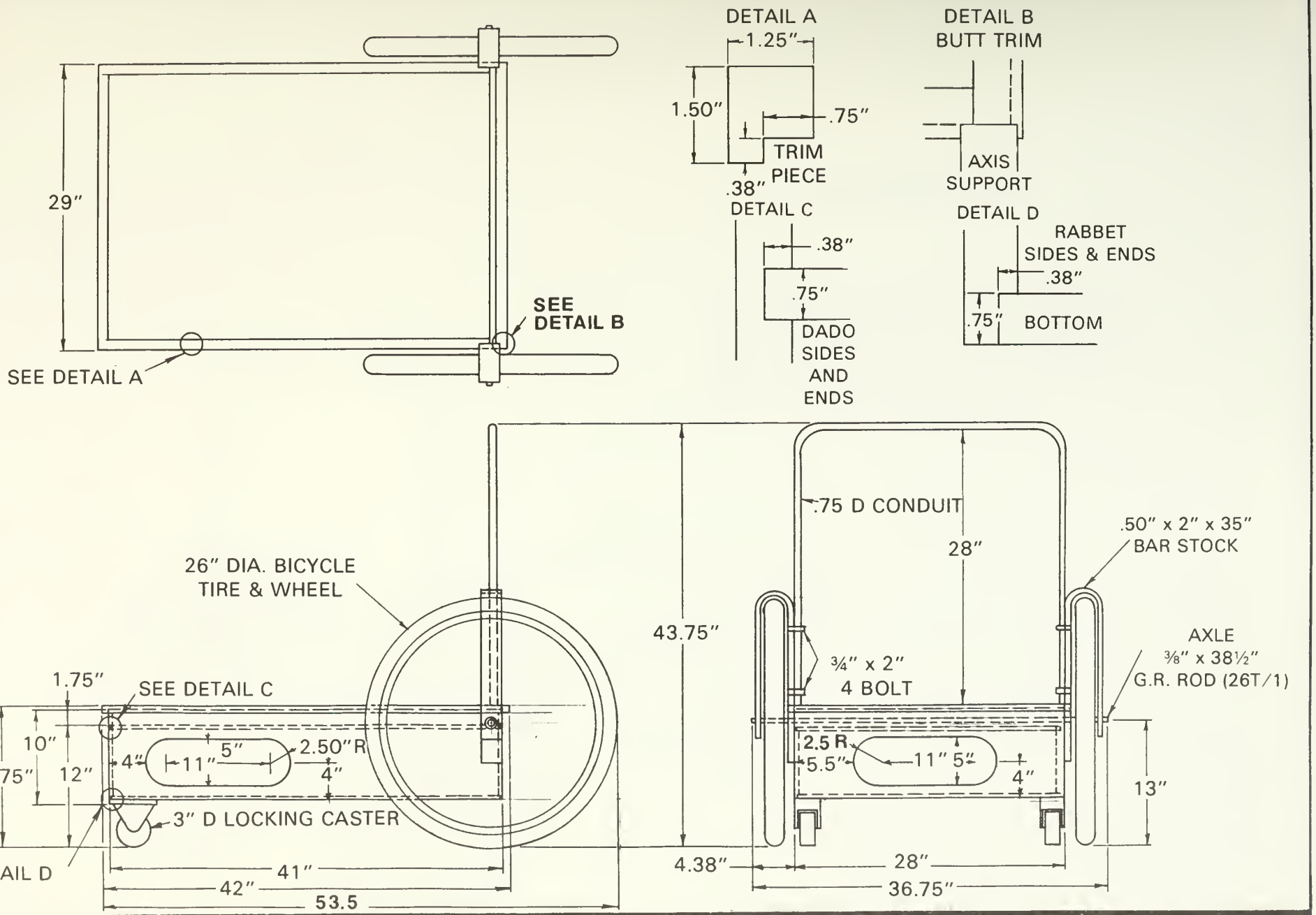
THE WORKBENCH



THIS ADJUSTABLE WORKBENCH WILL ACCOMMODATE A WIDE RANGE OF WHEELCHAIR POSITIONS AND HEIGHTS. THE EXTENDED TABLE TOP ALLOWS FOR CLOSE PROXIMITY WORK. C-CLAMPS HOLD-DOWNS MAY BE PLACED IN BENCH HOLES TO FACILITATE DEXTERITY AND WORKING EASE.

WORK BENCH

ITEM	MATERIAL
WORKBENCH TOP	2 x 4 PINE-GLUED ON FACE - EDGE GRAIN UP - PLANED TO THICKNESS
BENCH TOP BRACKETS	3" CHANNEL IRON ½" PLATE STEEL GUSSETS ⅜" x 3" CARRIAGE BOLTS - BRACKET TO TOP FASTENER
FLOOR MOUNTED BASE (ADJUSTABLE)	½" PLATE STEEL - BASE & GUSSETS 2¼" I.D. PIPE ½" O.D. STEEL PINS



APPARATUS FOR THE HANDICAPPED		
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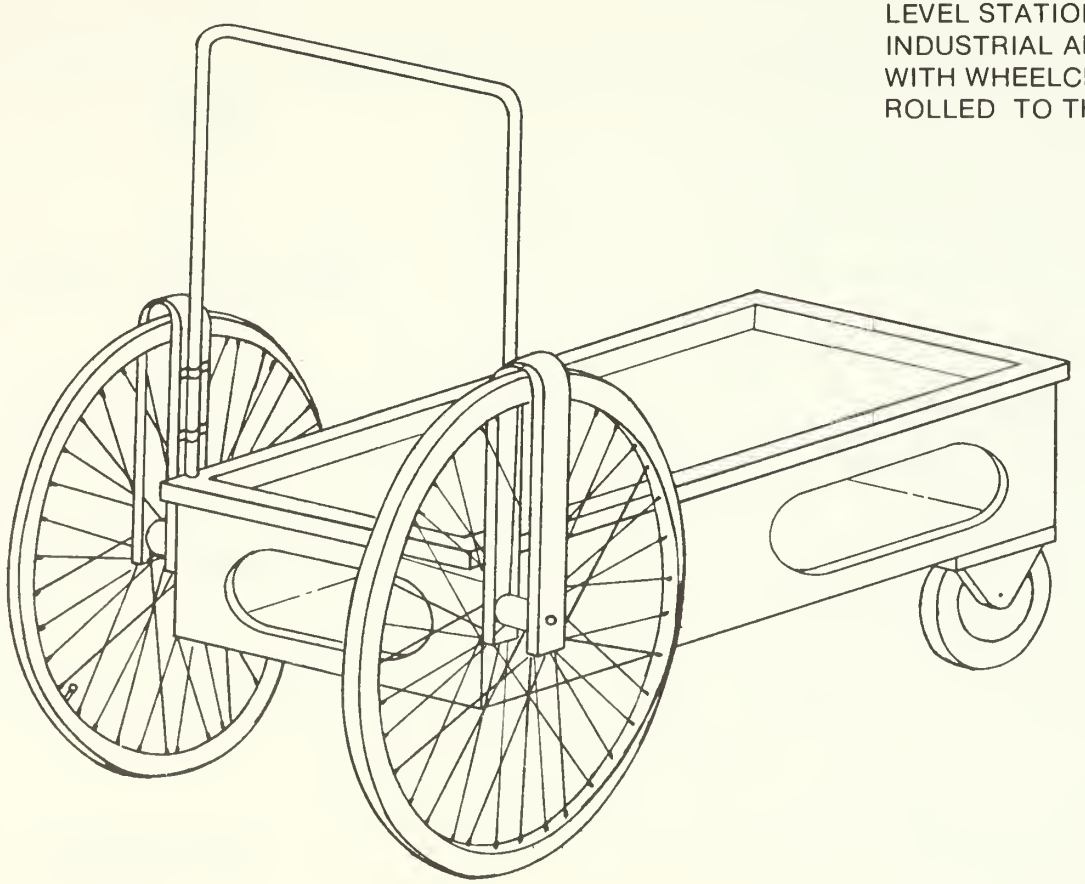
SCALE: ⅛" x 1"	TITLE: WHEEL CHAIR CART	

WHEELCHAIR CART

THIS WHEELCHAIR CART PROVIDES THE ADDITIONAL HEIGHT NEEDED FOR MANY CHEST-LEVEL STATIONARY MACHINES FOUND IN THE INDUSTRIAL ARTS LABORATORY. THE CART WITH WHEELCHAIR MAY BE PUSHED OR ROLLED TO THE WORK STATIONS.



WHEEL CHAIR CART

ITEM	MATERIAL
BASE STRUCTURE	¾" FIR PLYWOOD 2" x 2" PINE
WHEELS	(2 EA.) 26" DIA. BICYCLE WHEELS (2 EA.) 3" DIA. LOCKING CASTERS
WHEEL SUPPORT	½" x 2" HOT ROLLED STEEL
CART HANDLE	¾" CONDUIT
HARDWARE	¾" x 2" U-BOLTS OTHER AS REQ. BY PLAN

WHEEL CHAIR CART

ITEM	MATERIAL
BASE STRUCTURE	¾″ FIR PLYWOOD 2″ x 2″ PINE
WHEELS	(2 EA.) 26″ DIA. BICYCLE WHEELS (2 EA.) 3″ DIA. LOCKING CASTERS
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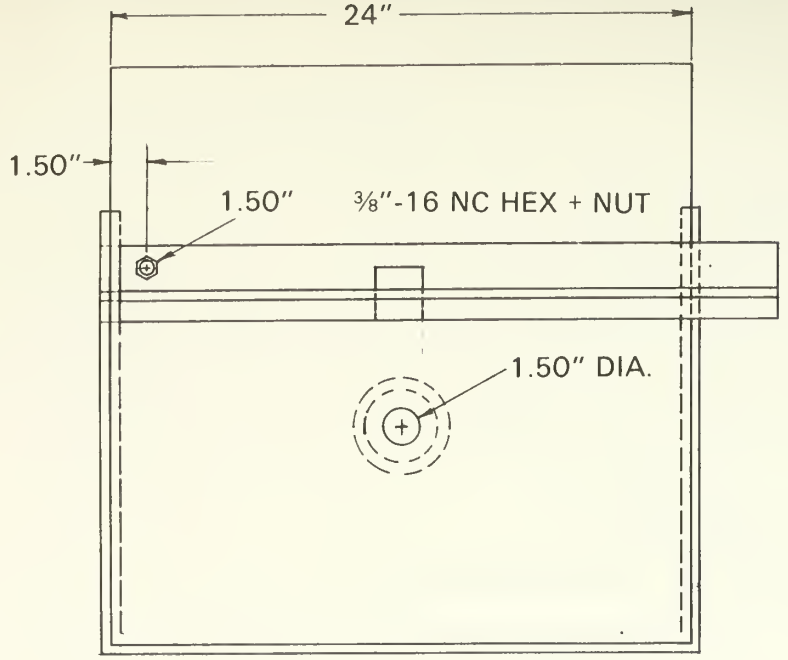
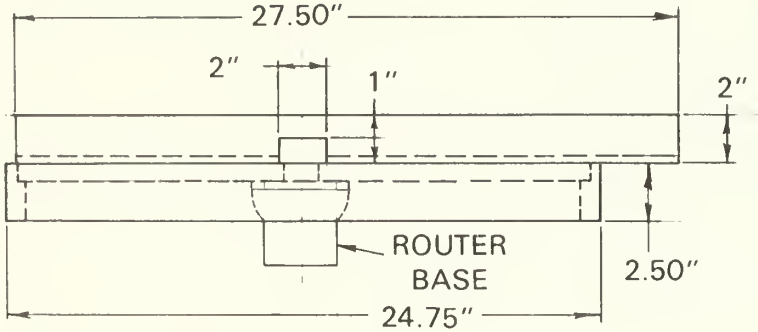
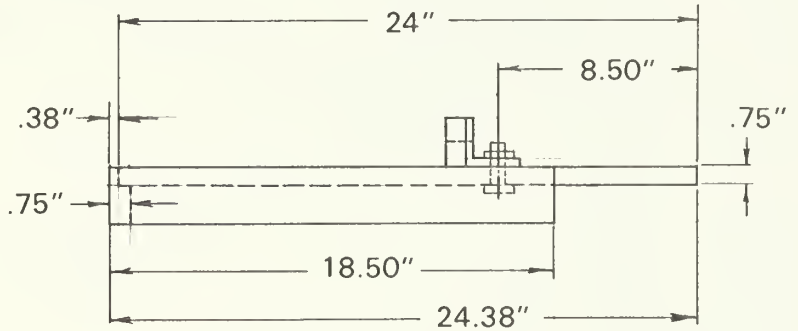
HARDWARE	¾″ x 2″ U-BOLTS OTHER AS REQ. BY PLAN



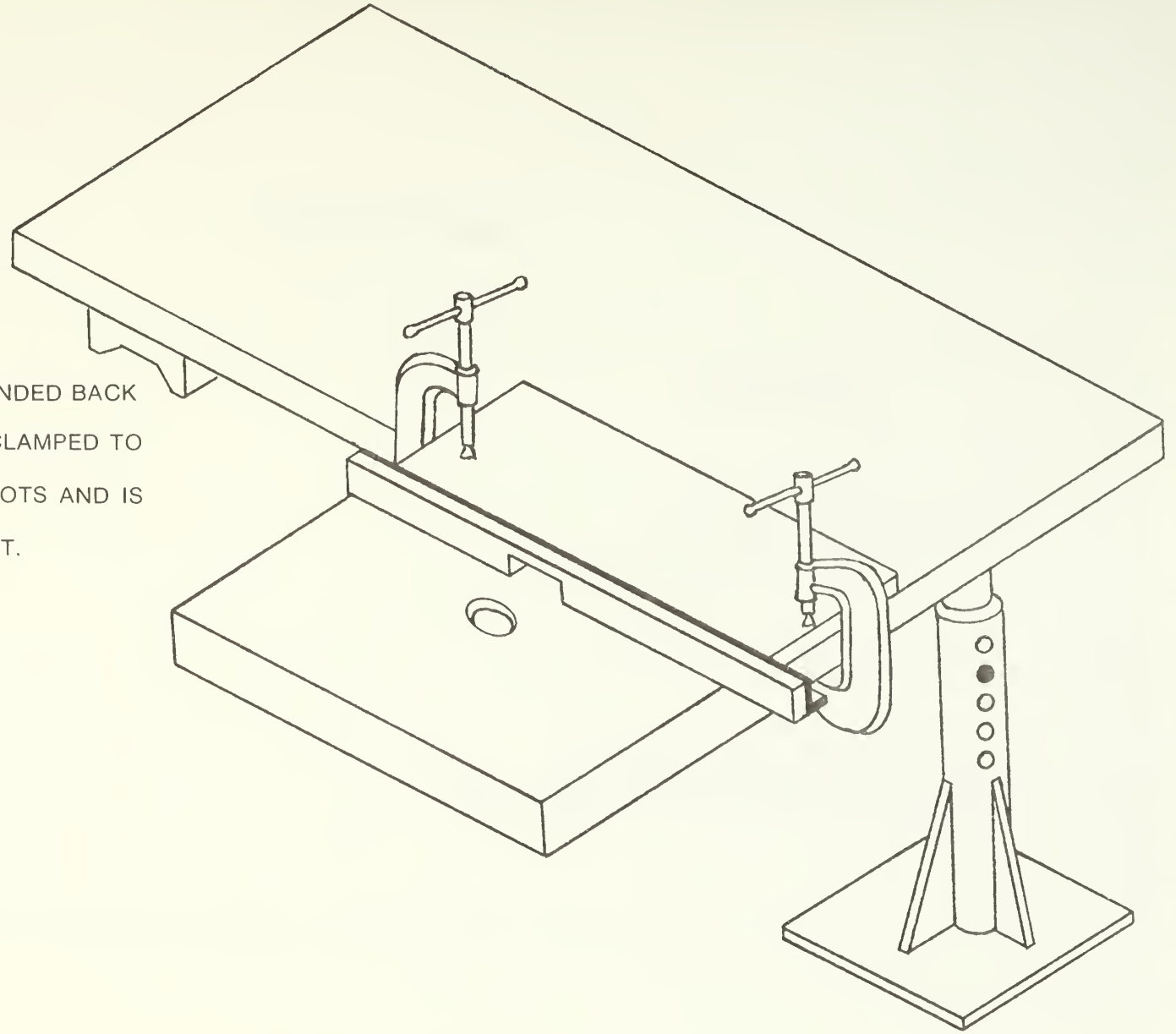




APPARATUS FOR THE HANDICAPPED		
THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM	K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 11
SCALE: ⅛″ = 1″	TITLE: ROUTER TABLE	

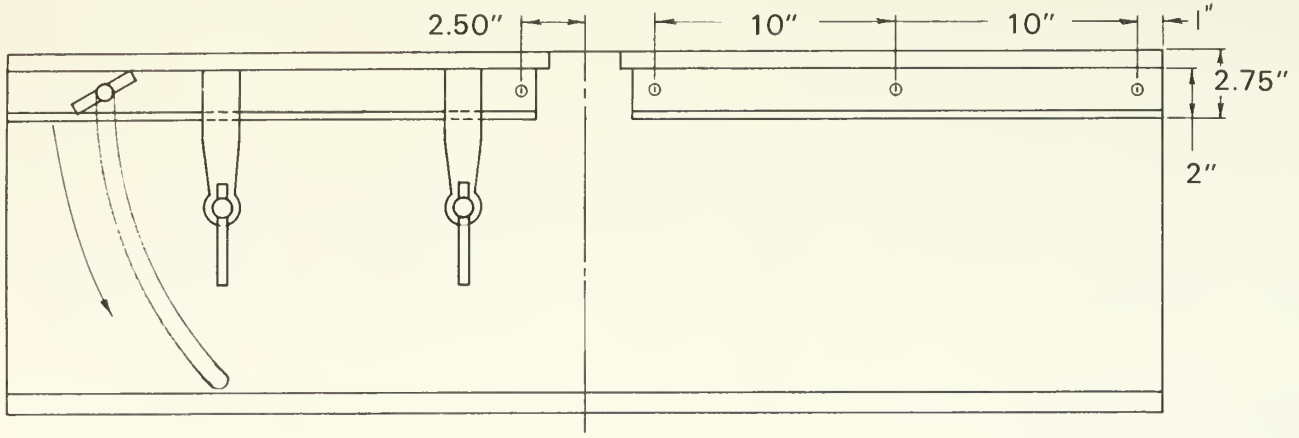
THE ROUTER TABLE

THE ROUTER TABLE HAS AN EXTENDED BACK EDGE WHICH ENABLES IT TO BE CLAMPED TO ANY WORKBENCH. THE FENCE PIVOTS AND IS ALSO C-CLAMPED FOR ADJUSTMENT.

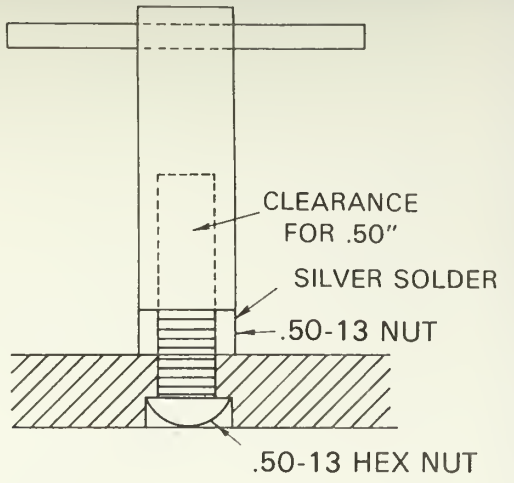


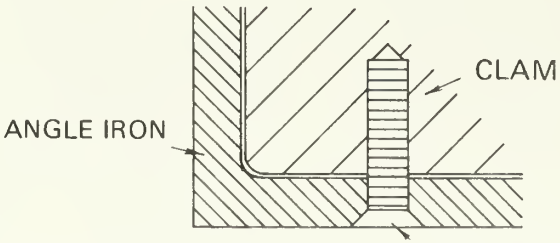
ROUTER TABLE

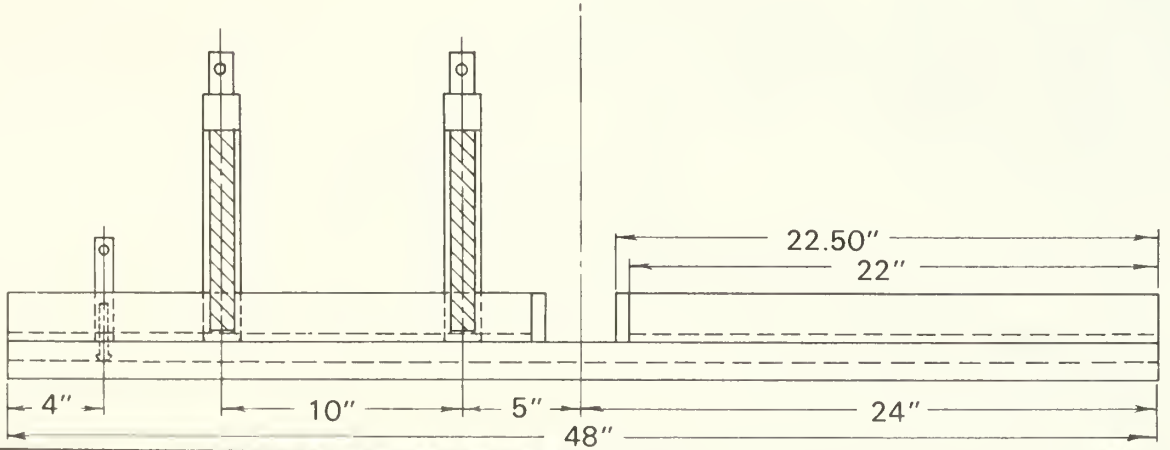
ITEM	MATERIAL
TABLE	¾" PLYWOOD (BIRCH) ¾" SOLID STOCK (HARDWOOD)
FENCE	2" x 2" x ¼" ANGLE IRON
HARDWARE	⅜"-16 x1½" NC BOLT & NUT 1¼" x #8 FLAT HD WOOD SCREWS

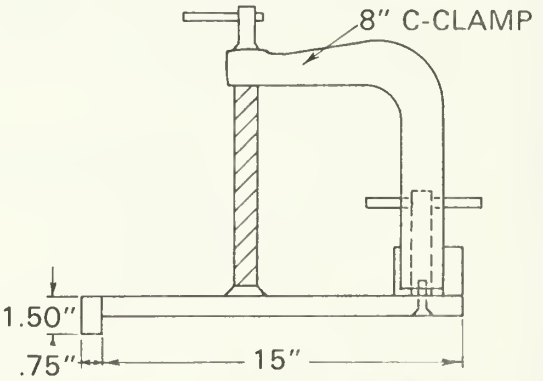


FENCE LOCK DETAIL

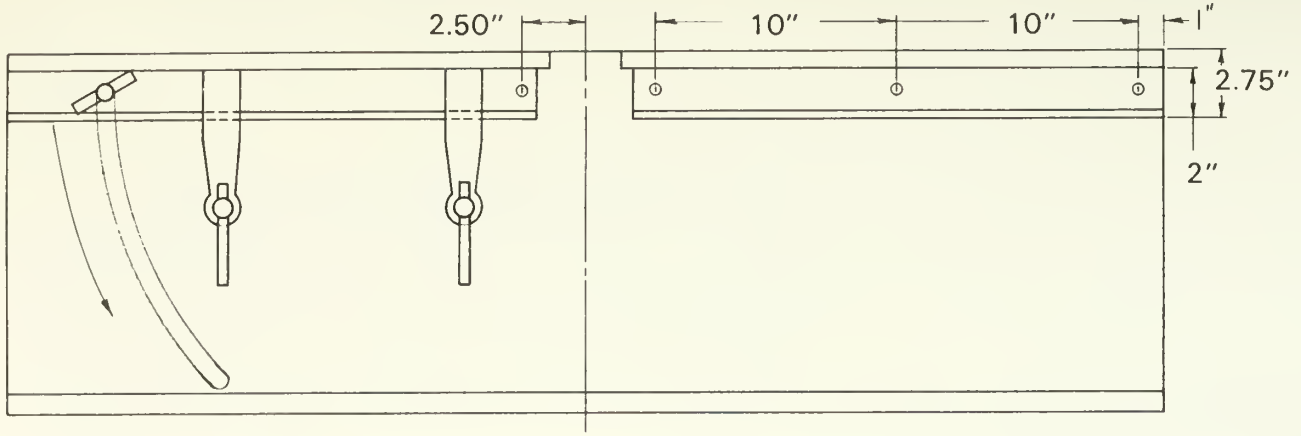




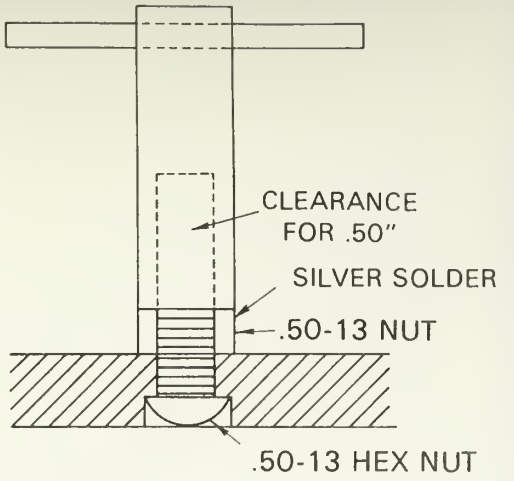


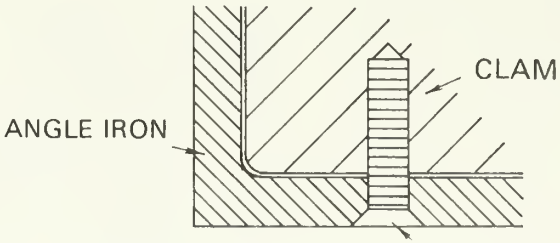


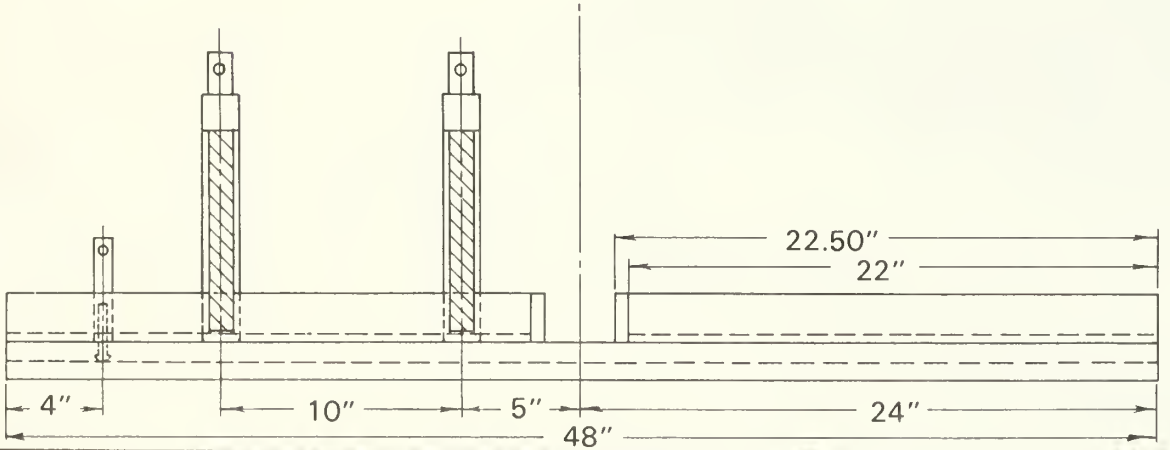
APPARATUS FOR THE HANDICAPPED		
THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM	K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 12
SCALE: ⅛" = 1"	TITLE: RADIAL ARM SAW FIXTURE	

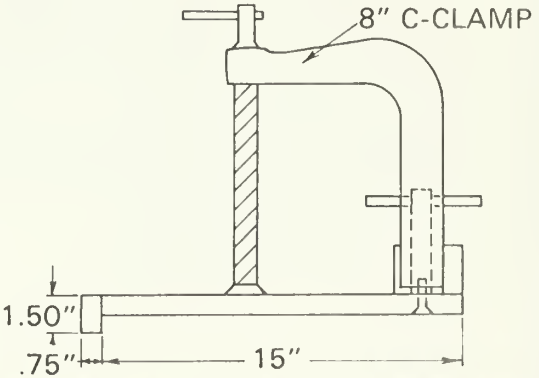


FENCE LOCK DETAIL









APPARATUS FOR THE HANDICAPPED

THE SPECIAL NEEDS LEARNER IN THE VOCATIONAL CLASSROOM

K. L. BRUWELHEIDE
MONTANA STATE UNIVERSITY
MONTANA OFFICE OF PUBLIC INSTRUCTION

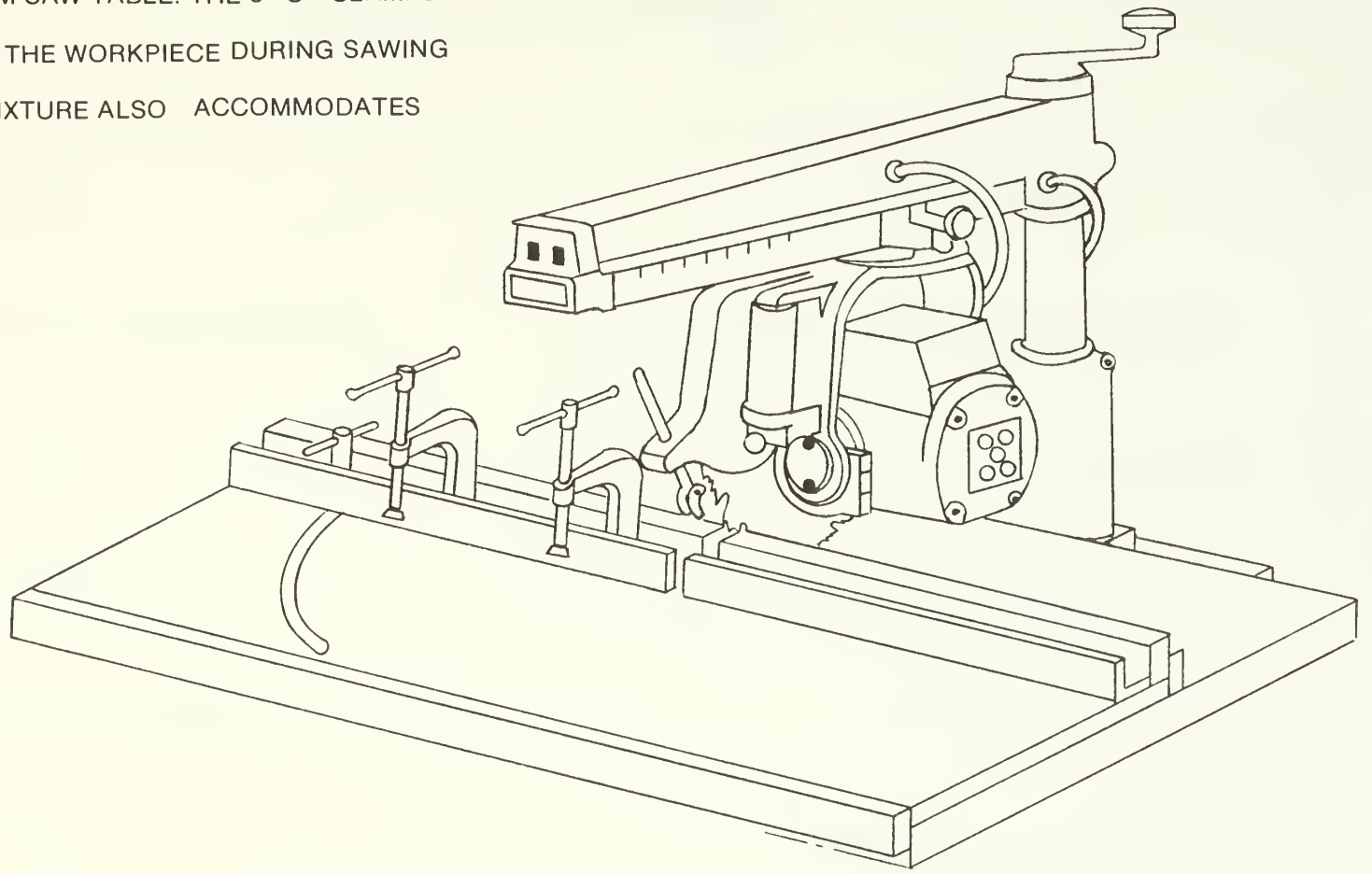
DWG 12

SCALE: ⅛" = 1"

TITLE: RADIAL ARM SAW FIXTURE

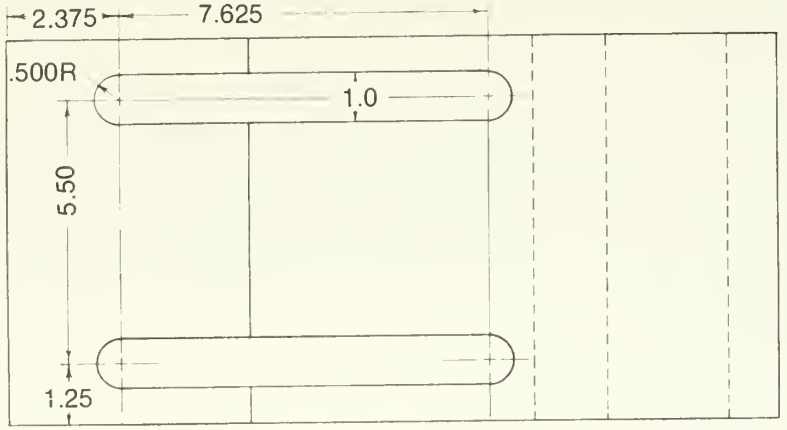
THE RADIAL ARM SAW FIXTURE

THIS FIXTURE IS DESIGNED TO CLAMP ON THE EXISTING RADIAL ARM SAW TABLE. THE 8" C - CLAMPS SERVE TO STABILIZE THE WORKPIECE DURING SAWING OPERATIONS. THIS FIXTURE ALSO ACCOMMODATES ANGULAR CUTTING.



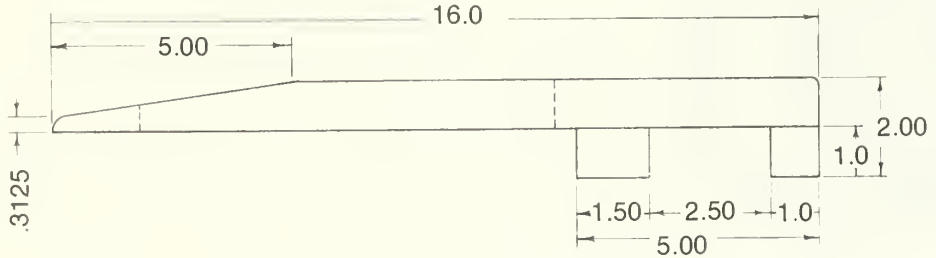
RADIAL ARM SAW FIXTURE

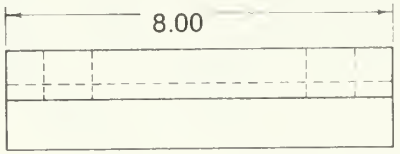
ITEM	MATERIAL
MATERIAL CUTTING SURFACE	¾" PLYWOOD - PREFERABLY BIRCH
BACK RAILS	¾" SOLID STOCK - HARDWOOD
METAL BACK STOPS	2" x 2" x ¼" ANGLE IRON
HOLD DOWN CLAMPS	8" C-CLAMPS
FASTENERS	ASSORTED HARDWARD (NOTED IN DRWG.)



NOTE: TOP SURFACE LAMINATED ASH
MAPLE OR BIRCH

BOTTOM SLOTTED PART FASTENED WITH GLUE

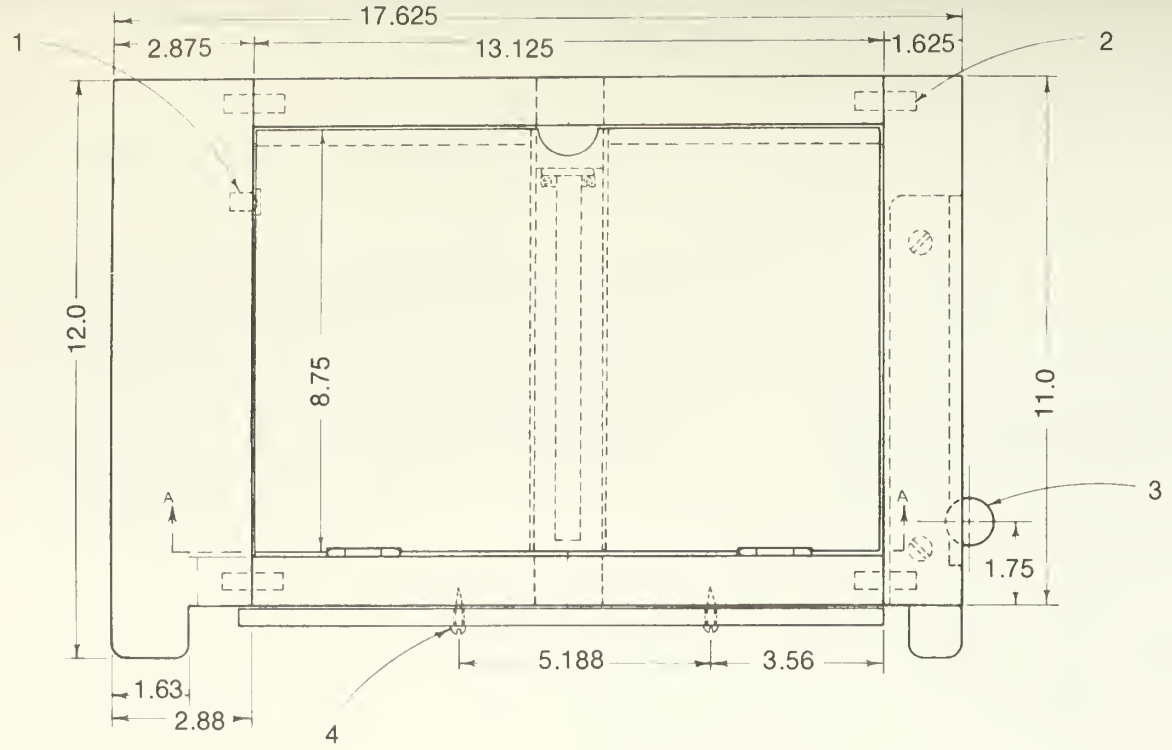


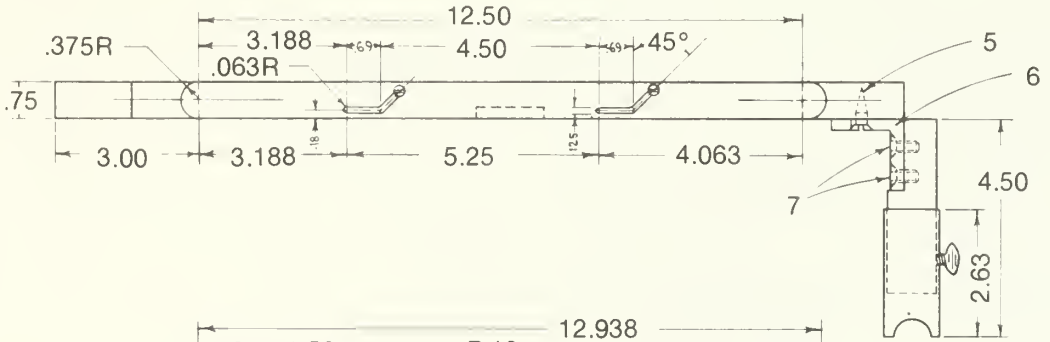


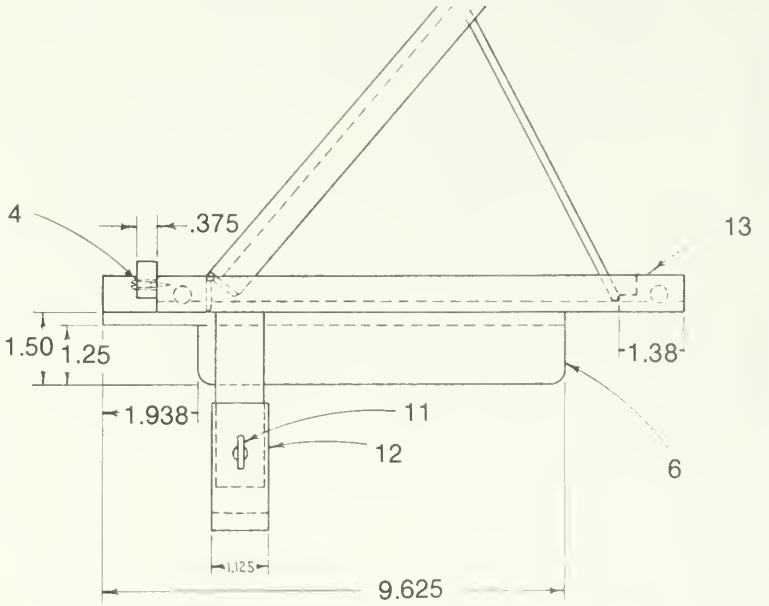
APPARATUS FOR THE HANDICAPPED PROJECT		
DEPT. OF AGRICULTURAL & INDUSTRIAL EDUCATION MONTANA STATE UNIVERSITY BOZEMAN, MONTANA	K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 13
SCALE 1/4" = 1" TITLE: WHEELCHAIR TRANSFER BOARD		

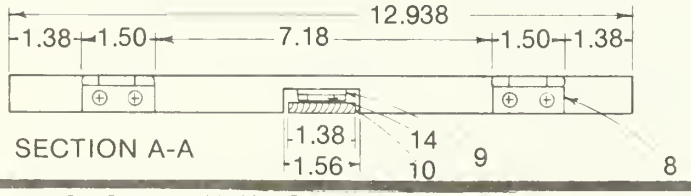
WHEELCHAIR TRANSFER BOARD

THIS LAMINATED BOARD ALLOWS A HANDICAPPED PERSON TO SLIDE FROM WHEELCHAIR TO OTHER REQUIRED SURFACES. ONE END IS GRADUALLY BEVELED FOR INITIAL LIFT ON. FINGER SLOTS PROVIDE FOR ADDED STABILITY AND EASE IN HANDLING.







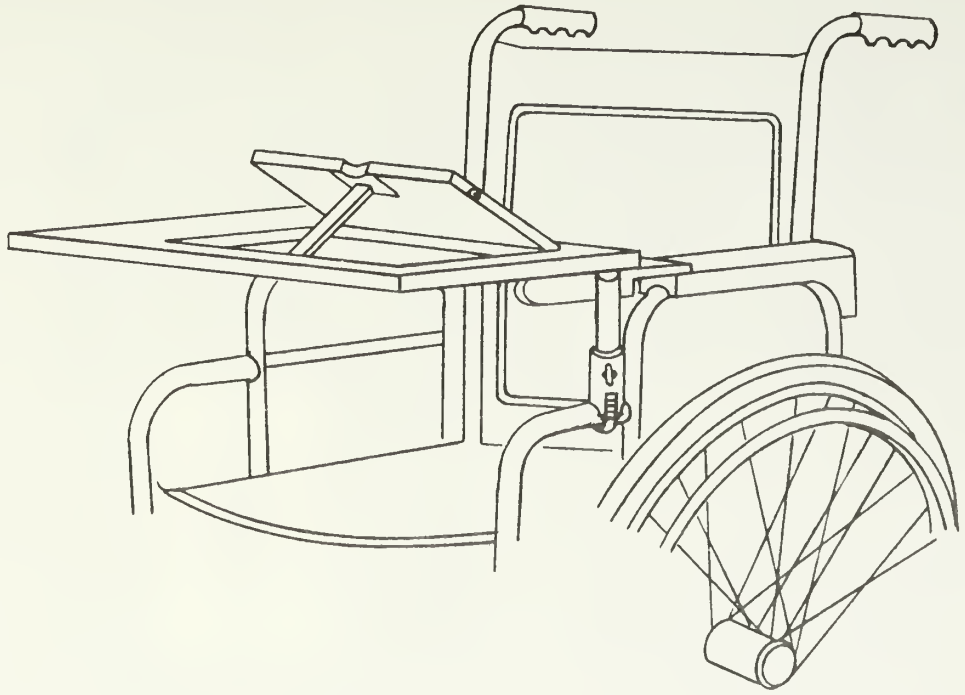


SECTION A-A

APPARATUS FOR THE HANDICAPPED PROJECT			
DEPT. OF AGRICULTURAL & INDUSTRIAL EDUCATION MONTANA STATE UNIVERSITY BOZEMAN, MONTANA		K. L. BRUWELHEIDE MONTANA STATE UNIVERSITY MONTANA OFFICE OF PUBLIC INSTRUCTION	DWG 14
SCALE ¼" = 1	TITLE: WHEELCHAIR READING BOARD		

WHEELCHAIR READING BOARD

THIS ADJUSTABLE READING/LAP TABLE WILL ACCOMMODATE DISABLED PERSONS WITH LIMITED RANGE OF MOVEMENT. THE ENTIRE UNIT MAY BE QUICK RELEASED AND REMOVED BY THUMBSCREW OR MERELY SWUNG OUT OF THE WAY WHEN NOT IN USE. THE FOLDED BOARD HAS A FLAT PROFILE FOR STORAGE IN A SUPPLEMENTAL PACK.



MATERIAL

NO.	PART NAME	QTY	MATERIAL
14	.188" X .50" X 7.625 BAR STOCK	1	ALUMINUM
13	3/4" X 1-3/8" X 13-1/8" TOP FRAME	1	MAPLE
12	1-1/8" O.D. - 1" I.D. PIPE TUBE	1	STEEL
11	1/4"-20-5/8" THUMB SCREW	1	STEEL
10	1/4" X 1-3/8" X 11" CENTER FRAME	1	MAPLE
9	3/8" X 1" MODIFIED BUTT HINGE	1	ALUMINUM
8	3/4" X 1-1/2" BUTT HINGE	2	BRASS
7	1/4" - 2D UNC - 2A X 5/8" FH CAP SCR	2	STEEL
6	1/4" X 1-1/2" X 1-1/2" ANGLE STOCK	1	ALUMINUM
5	NO. 12 X 3/4" FH WOOD SCREW	2	BRASS
4	NO. 5 X 3/4" RH WOOD SCREW	2	BRASS
3	1" X 3-5/8" ROUND STOCK, SOLID	1	ALUMINUM
2	3/8" X 1-1/4" DOWEL	4	BIRCH
1	3/8" FRICTION CATCH	1	BRASS